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Memories of childhood hikes through the woods, swims at the beach and sunny picnics at the park are basic to the Hoosier experience. Indiana's natural treasures–its parks, waterways and forests–are affected by our use of natural resources.

The quality of our environment is a vital part of our children's future. With cleaner air to breathe, water to drink, and land on which to play, we are building brighter beginnings for our children, who are the future of our state. By reducing children's exposure to toxic chemicals, educating families and involving children in the environment, we can make Indiana a safer place for our children and ourselves.

The Indiana Department of Environmental Management's *1999 State of the Environment Report* provides valuable information on the quality of our environment and the improvements we have made.

As we approach the next millennium and Indiana's 200th birthday in 2016, our efforts to improve and protect Indiana's natural environment should remain a primary focus. As Indiana has proven in the past, a healthy economy and environmental progress are critical to the prosperity of our state.

Sincerely,

Frank O'Bannon

Frank O'Bannon
Governor

I am pleased to present the Indiana Department of Environmental Management's *1999 State of the Environment Report*.

This report provides clear and concise facts about the current conditions of Indiana's environment. It tells us how clean our air, water and land are. It highlights the progress we have made over the years and the areas still needing our attention.

It is designed to be a tool for the public, an easy-to-understand summary of the state of our environment. We all have a right to this information, and we have a need for it if we are to meet the environmental challenges that lie ahead.

We have sought to improve upon last year's report based on your comments and suggestions. This report contains greater detail and improved explanations in order to convey the data more effectively. We have expanded your ability to obtain additional information by providing contact information within the report and by offering links to other sites in the on-line version of this report, available at www.state.in.us/idem/soe/.

The environmental challenges facing Indiana are complex and difficult. We must focus upon our state's resources–the land, air and water–protecting them from future harm while combating past pollution and damage.

Together we can make a difference in the quality of our environment. By sharing information and responsibility, we also share the opportunity to protect, preserve and promote our environment.

Sincerely,

John M. Hamilton
Commissioner

Introduction

State of Indiana's environment

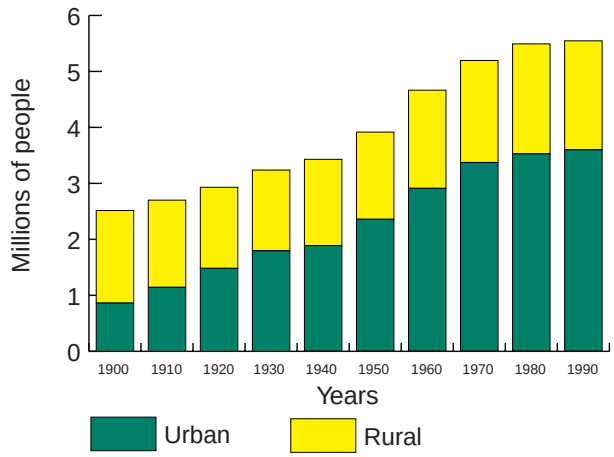
This is the second annual *State of the Environment Report* published by the Indiana Department of Environmental Management. The report provides a snapshot of Indiana's environment in 1998, summarizing the condition of Indiana's air, water and land.

Indiana's prosperity and our quality of life depend greatly on the quality of our environment.

Our population has more than doubled in this century. Manufacturing is a big part of Indiana's economy–more than in almost any other state in the country. Agriculture is also a significant part of the economy. All of this activity stresses our natural resources and our environment.

As a state, we have made great efforts in recent years to improve and protect our environment. As a result, our air is much cleaner. Our rivers and lakes are less polluted. We manage our dangerous waste products more safely. Polluted sites are being cleaned up, and all of us have increased our awareness about how we affect our environment. Some problems have been solved: Lead is out of our gasoline and paint, phosphorous contamination of surface water has decreased, wastewater treatment has improved, and landfills are now properly built and managed.

Indiana population



Source: U.S. Census Bureau, 1990

Where Hoosiers work

• Manufacturing	24 percent
• Services	23 percent
• Retail Trade	19 percent
• Government	13 percent
• Transportation, Communications, Public Utilities	5 percent
• Wholesale Trade	5 percent
• Finance, Insurance, Real Estate	5 percent
• Construction	5 percent
• Agriculture/Other	1 percent

Source: Indiana Department of Workforce Development, 1997

We have made real progress in the past 20 years, but many environmental challenges remain. Too many Hoosiers still breathe unhealthy air or live near threatened waters or contaminated sites. Each year valuable farmlands, forests, lakes and wetlands are threatened or lost by the ongoing growth and movement of our population.

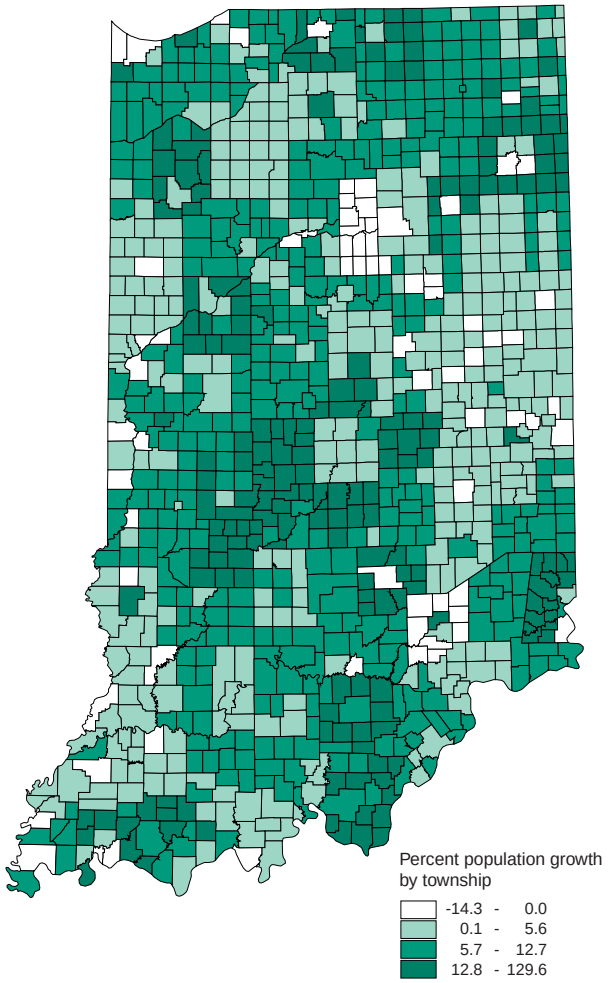
Our collective commitment to protect our environment must grow along with our expectations for a better life for ourselves and our children. We all want a high quality of life, which includes a high quality economy and a high quality environment– they are two sides of the same coin.

To continue to clean our air, water and land, we must:

- Solve water quality problems in an integrated manner by watershed and basin;
- Integrate smart environmental decision-making into business and government planning;
- Prevent pollution whenever possible;
- Better manage the stresses created by urban development and rural activities; and
- Minimize effects of chemicals on the environment.

Use this report, seek more information and be involved in your environment. We all have to pitch in to improve Indiana's environment and our future.

Population change 1990-1996



Source: Indiana Business Research Center, 1998

This report, with links to more detailed information, is posted on IDEM's World Wide Web site at www.state.in.us/idem/soe/99report/.

Indiana State of the Environment Report

Air Quality

Photo by Richard Fields, Indiana Department of Natural Resources.

Hoosiers want clean, healthy air. Whether commuting to work, enjoying a horse ride on an Owen County farm or standing atop Mt. Baldy in the Indiana Dunes, clean air is important to the quality of our life and the enjoyment of Indiana's natural resources.

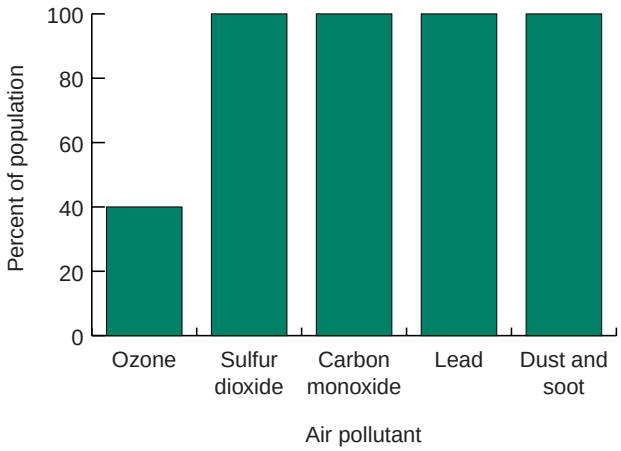
Air quality

Air pollution

Indiana's air has become significantly cleaner in the last 10 years. Stricter standards and better compliance by industry have reduced smog and dust levels and improved visibility. Indiana's air meets health standards set by the U.S. Environmental Protection Agency (EPA) for sulfur dioxide, carbon monoxide, lead, dust and soot across the state. However, in some parts of the state, ozone levels still exceed federal standards. Levels of toxic chemicals, for which there are no federal standards, also are of concern in Indiana.

Air pollution has numerous health effects. Children, the elderly and people with lung diseases are especially susceptible to health complications from air pollution. Pollutants in the air we breathe can cause a scratchy throat, coughing, difficulty breathing, watery eyes, inflamed lung tissue, aggravated asthma, lung disease, cancer, reduced immune defenses and other problems. Air pollution comes from motor vehicles, industry and many other everyday activities.

Percent of Indiana's population breathing healthy air
By pollutant



Source: IDEM Office of Air Management, air monitoring data, 1999

for more details visit air @ www.state.in.us/idem/soe/99report/air

Ozone

Ozone in the upper atmosphere is the "good" ozone that protects us from the sun's radiation. Ground-level ozone, which is formed when volatile organic compounds (VOCs), nitrogen oxides (NOx) and sunlight mix, is the "bad" ozone that irritates the lungs and causes significant health problems for many people. Ozone is an air quality problem in the summer months when temperature and sunlight are the greatest.

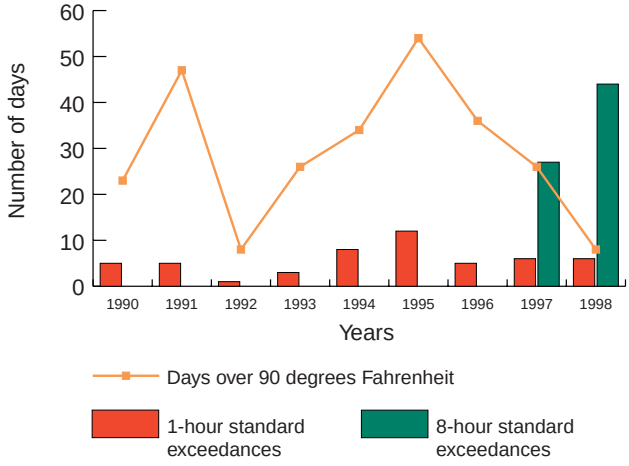
Ozone can lead to reduced lung function, increased respiratory inflammation, coughing, chest pain and nausea. Children are especially at risk from ground-level ozone because they breathe more air for their body weight than adults and spend more time outdoors in the summer.

Until 1997, the nation's ozone standard was 125 parts per billion, measured over one hour. When a monitor in an area exceeded the standard more than once a year, the area did not attain the standard. In July 1997, EPA established a more stringent ozone standard based on health studies addressing longer term exposure. This standard requires concentrations of less than 85 parts per billion, measured over eight hours, and more closely reflects exposure to people who work and play outside in the summer. The one-hour standard remains in effect only for those counties that have not met this standard: Clark, Floyd, Lake and Porter.

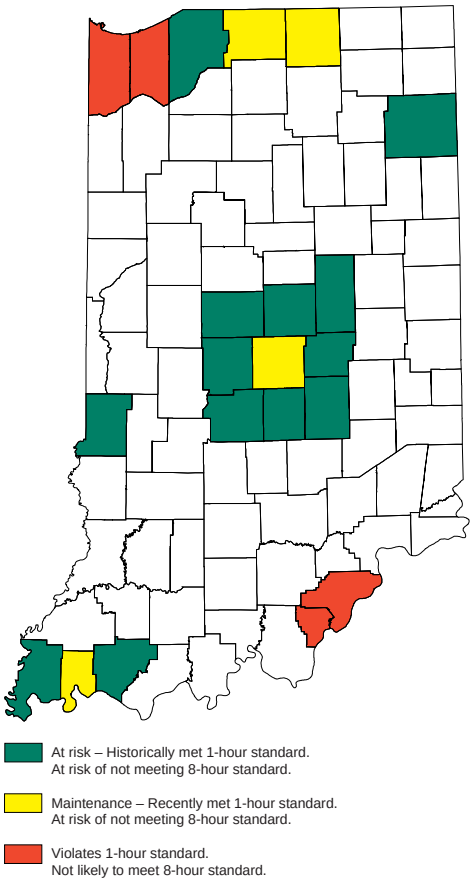
Percent of Indiana's population in areas not meeting the ozone health standards

- 13 percent of Indiana's population lives in areas that do not meet the one-hour standard for ozone.
- 60 percent of Indiana's population lives in areas that likely will not meet the new eight-hour standard for ozone.

Indiana unhealthy ozone days



Areas not likely to meet the ozone standard



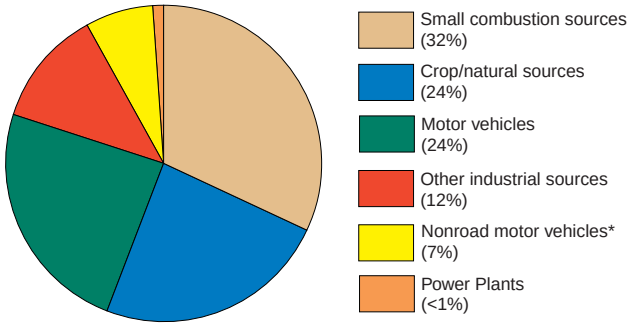
Source: IDEM Office of Air Management, 1998

Ozone sources

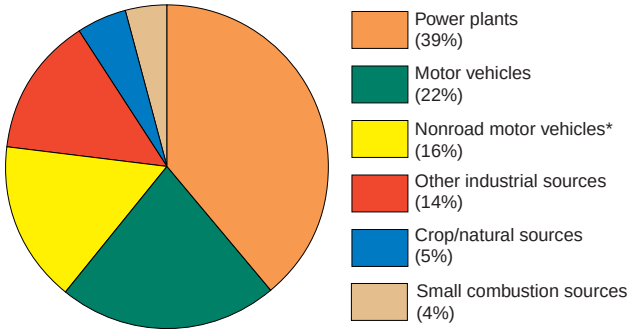
Ozone levels are typically higher in urban areas that are densely populated. Motor vehicles, manufacturing and other industrial activities emit nitrogen oxides and volatile organic compounds that react in sunlight to form ozone. Pollutants that cause ozone include gasoline vapors, chemical solvents and combustible fuels. Additionally, emissions of nitrogen oxides from smoke stacks can travel downwind and increase ozone levels in surrounding urban and rural areas.

Major contributors to ozone

Sources of volatile organic compounds in Indiana



Sources of nitrogen oxides in Indiana



* Nonroad motor vehicles – agriculture, lawn, recreational and construction equipment

Source: IDEM Office of Air Management, 1998.

Regional nature of ozone

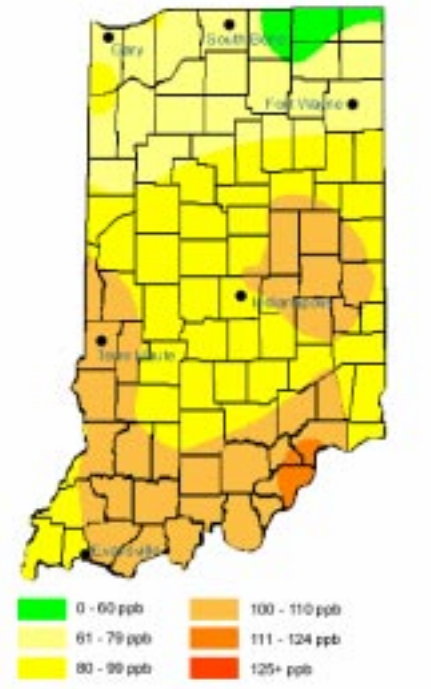
Ozone is generated locally and is transported from upwind sources. Ozone and the pollutants that form ozone can be carried significant distances downwind from their points of origin.

Ozone is generated primarily within urban areas and is transported across county, state and national boundaries. Indiana's cars, factories and other human activities generate ozone that is transported within Indiana and to other states. In turn, the ozone generated by our neighboring states is carried across our borders and affects the quality of air Indiana's citizens breathe. Consequently, the areas in Indiana that do not meet health standards for ozone cannot fully solve their own ozone problems by themselves.

In mid-August, a high pressure system over mid and southern Indiana provided several consecutive sunny days with near-90° temperatures, ideal weather conditions for the formation of ground-level ozone. The adjacent maps show one-hour and eight-hour ozone concentration levels in Indiana for August 22, 1998. The ozone levels are based on monitoring data put into a model that shows regional ozone patterns. The maps also demonstrate how ozone spreads and is not necessarily concentrated in urban areas.

Ozone peak values on August 22, 1998

1-hour average concentration



(ppb - parts per billion)

8-hour average concentration

Source: U.S. Environmental Protection Agency, 1998

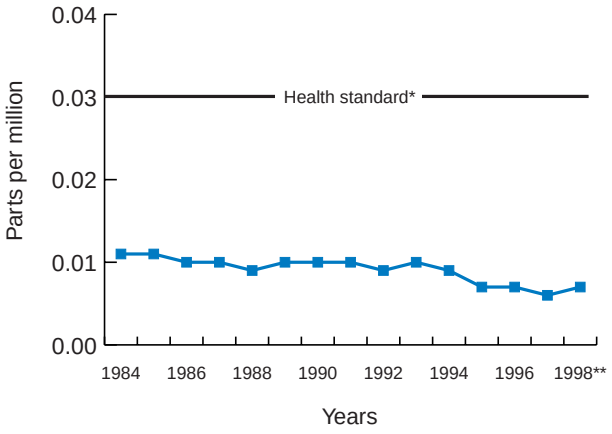
Sulfur dioxide

Sulfur dioxide can cause breathing impairment of asthmatic children and adults, as well as aggravating existing respiratory illnesses and cardiovascular disease. Populations particularly sensitive to sulfur dioxide include children, older adults, asthmatics and people with chronic lung disease. Also, sulfur dioxide is a primary component of acid rain, which is discussed on page 12.

Sulfur dioxide air quality in Indiana has improved dramatically. All areas of Indiana currently meet federal health standards for sulfur dioxide. Indiana's annual sulfur dioxide emissions from coal-fired power plants have fallen from more than 1.5 million tons in 1980 to approximately 0.5 million tons in 1996. Many Indiana power plants have greatly reduced sulfur dioxide emissions by investing in air pollution control equipment such as scrubbers, using low-sulfur coal and maximizing use of lower polluting boilers.

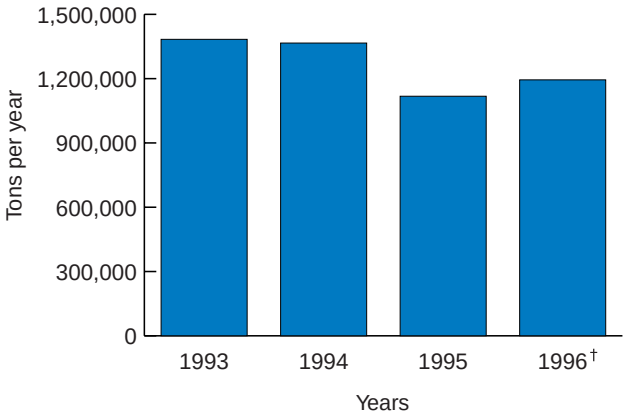
Levels of sulfur dioxide have decreased since the mid-1980s in Evansville, where annual averages remain well below the health standard.

Sulfur dioxide air quality
Statewide composite average

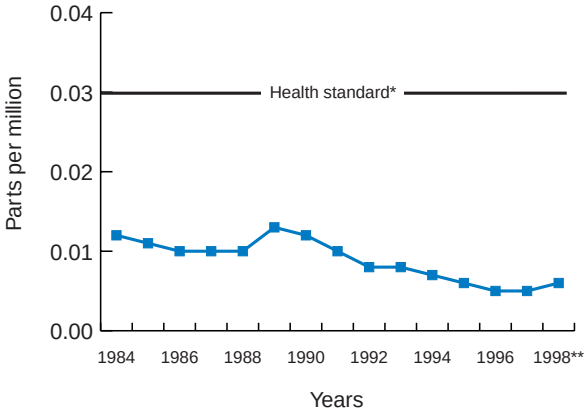


* 24 hour National Ambient Air Monitoring Quality Standard (NAAQS)
** Data for 1998 through June

Indiana sulfur dioxide emissions



Sulfur dioxide air quality
Evansville composite average



* Annual average
** Data for 1998 through June

† Since the *1998 State of the Environment Report*, adjustments have been made to the 1996 sulfur dioxide emissions data to reflect updated information from EPA.

Source: IDEM Office of Air Management, 1998

Carbon monoxide

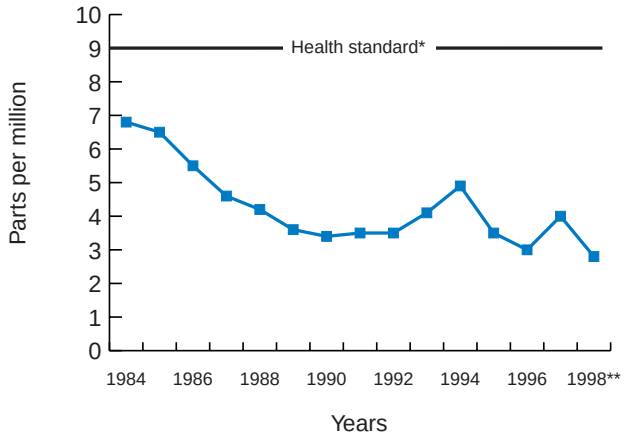
Carbon monoxide in the bloodstream reduces the flow of oxygen to tissues and organs, reducing vision and coordination and causing dizziness and reduced learning ability. Carbon monoxide is formed from incomplete combustion. Sources of carbon monoxide include vehicles, industrial processes and fuel combustion in boilers and incinerators.

All areas of Indiana currently meet federal health standards for carbon monoxide. Carbon monoxide levels continue to improve primarily due to stricter emission standards for new cars and improved combustion techniques and emission controls.

Levels of carbon monoxide have generally declined since the mid 1980s, with a slight increase since 1996.

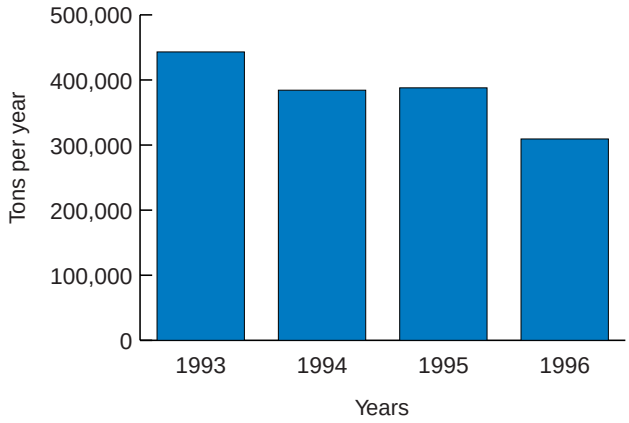
In areas such as East Chicago, where levels of carbon monoxide were below the eight-hour standard but often above the Indiana composite average, carbon monoxide levels have decreased overall since the mid 1980s.

Carbon monoxide air quality
Statewide composite average

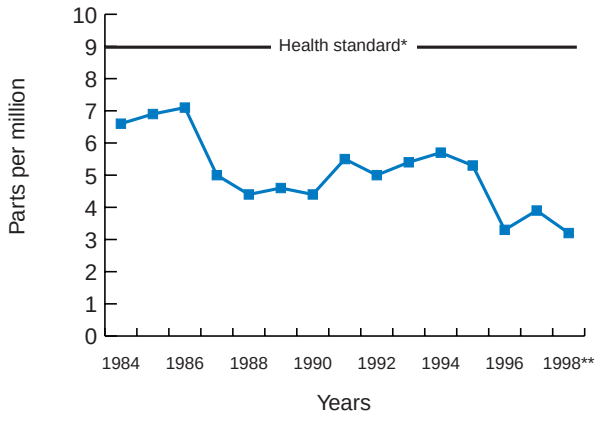


* 8 hour NAAQS
** Data for 1998 through June

Indiana carbon monoxide emissions



Carbon monoxide air quality
East Chicago composite average



* 8 hour NAAQS
** Data for 1998 through June

Source: IDEM Office of Air Management, 1998

Lead

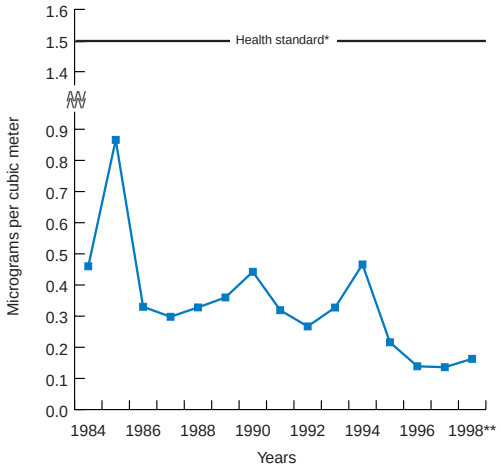
Excessive exposure to lead can result in lead poisoning and elevated blood lead levels, which may damage mental and physical attributes in children. While in the past the major source of lead was motor vehicles, the prohibition of leaded gasoline has significantly lowered lead levels. The remaining sources are facilities that process or produce materials that contain lead.

Aggressive state rules that limit emissions from these facilities and the closing of an Indianapolis facility have helped assure that no areas of Indiana have unhealthy lead levels in the air.

Levels of lead in Indiana's air have fallen dramatically since the mid 1980s, especially in Indianapolis. However, since 1995, there has been a slight increase in lead levels statewide.

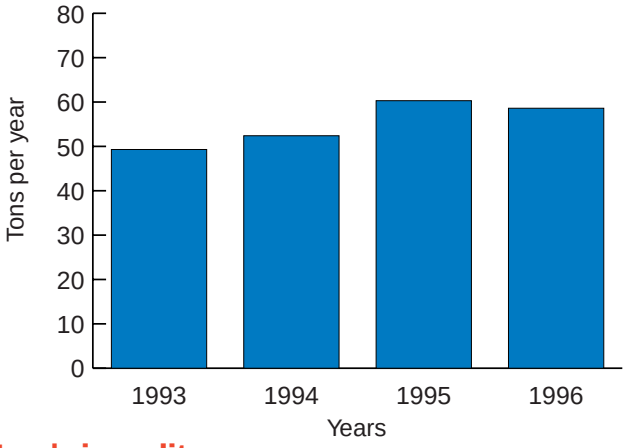
For more information about lead in Indiana's environment, see Chemicals in the Environment, page 48.

Lead air quality
Statewide composite average

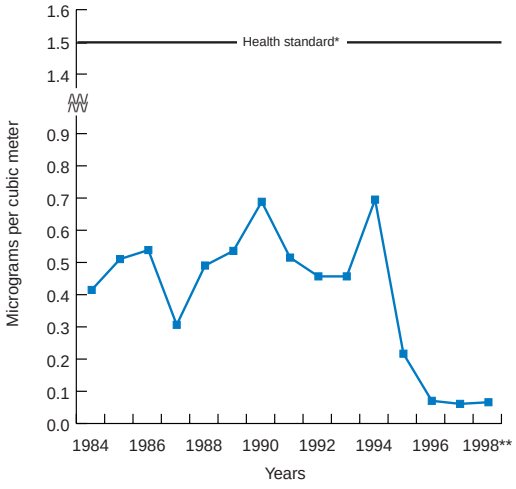


* Maximum calendar quarterly average - the greatest value of the four quarter averages in a given year.
** Data for 1998 through June.

Indiana lead emissions



Lead air quality
Indianapolis composite average



* Maximum calendar quarterly average - the greatest value of the four quarter averages in a given year.
** Data for 1998 through June.

Source: IDEM Office of Air Management, 1998

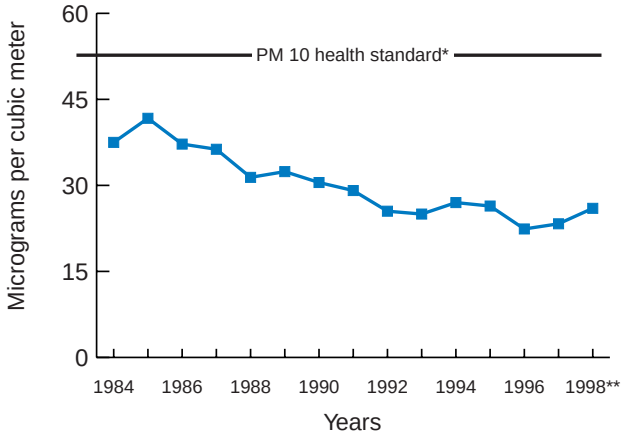
Dust and soot

Particulates are small pieces of aerosol mists, dust, dirt and soot emitted by sources such as cars, trucks, construction projects, factories, unpaved roads, fireplaces and wood stoves. Older adults, children and people with chronic lung disease are especially sensitive to particulates.

Recent studies indicate that the smallest particulates pose the most serious health threat because they can be inhaled more deeply into the lungs and are more difficult to exhale. In 1997, EPA established a new standard for particulates less than 2.5 micrometers (PM 2.5), or 25 times narrower than a strand of human hair. Like other states, Indiana is just beginning to establish sites that will monitor for PM 2.5. IDEM will place monitors at 40 locations statewide by the end of 1999 to evaluate the new standard. Once three years of data have been collected from these monitors, IDEM and EPA will determine whether any areas in Indiana exceed the new health standard for small particulates. During this time period, EPA will continue to review the PM 2.5 standard.

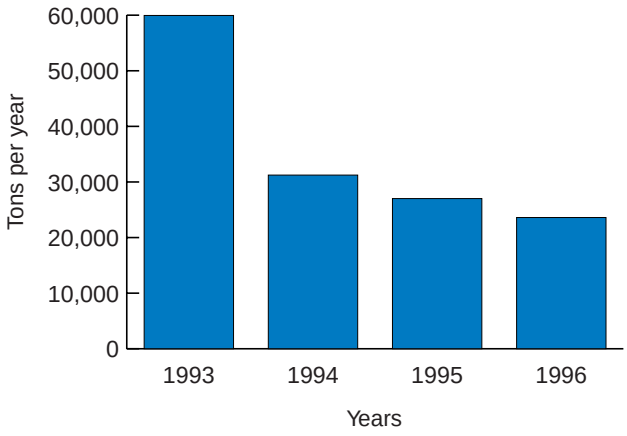
While there is little information on PM 2.5 levels, data have been collected on larger particles, PM 10, for a number of years. Levels of PM 10 in Indiana's air have fallen dramatically since the mid1980s, especially in areas such as Gary where health standards had been exceeded.

Particulate matter air quality
Statewide composite average

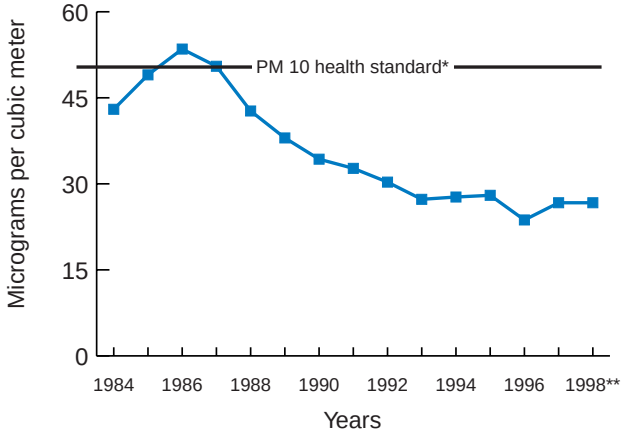


* Annual arithmetic mean
** Data for 1998 through Aug.

Indiana dust and soot emissions



Particulate matter air quality
Gary composite average



* Annual arithmetic mean
** Data for 1998 through Aug.

Source: IDEM Office of Air Management, 1998

Global climate change

Greenhouse gases in the atmosphere, such as carbon dioxide, methane and chlorofluorocarbons, trap the earth's heat and are thought by many scientists to be the cause of rising global temperatures. Global warming could change rain and temperature patterns and may affect Indiana's agriculture and quality of life.

Carbon dioxide, the primary greenhouse gas, occurs naturally, is exhaled by humans and animals, and is created by the combustion of fossil fuels. The global concentration of carbon dioxide has increased significantly in the modern industrial age. Energy conservation and the use of nonfossil fuels are ways to decrease the production of carbon dioxide.

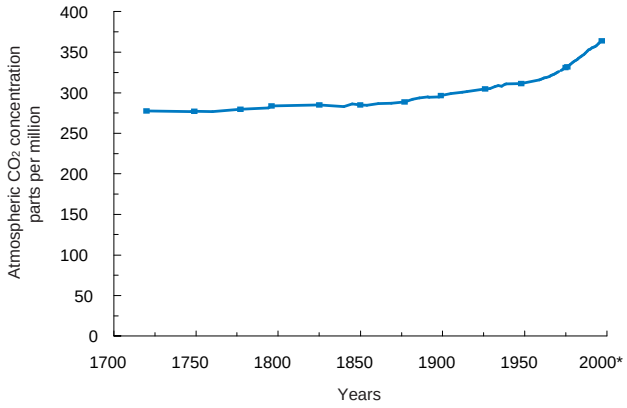
In 1990, Indiana sources emitted about 230 million tons of carbon dioxide, nearly 4 percent of the nation's total. Indiana ranks ninth among the states in carbon dioxide emissions.

Acid rain

Acid rain results from reactions involving sulfur dioxide, nitrous oxides and rainfall. While natural sources such as decaying plant life and volcanic eruptions contribute to acid rain, human sources, including the burning of fossil fuels and motor vehicle emissions, cause most acid rain.

Acid rain harms our aquatic life, causes the decay and corrosion of cars, paints, buildings and statues and damages forests and crops by affecting soil nutrients and killing essential bacteria. Acid rain does not cause significant problems for much of Indiana because soils and waterways are limestone-based and act as a natural buffer to acidic rainfall. Also, sulfur dioxide and nitrogen oxide emissions have been greatly reduced in recent years.

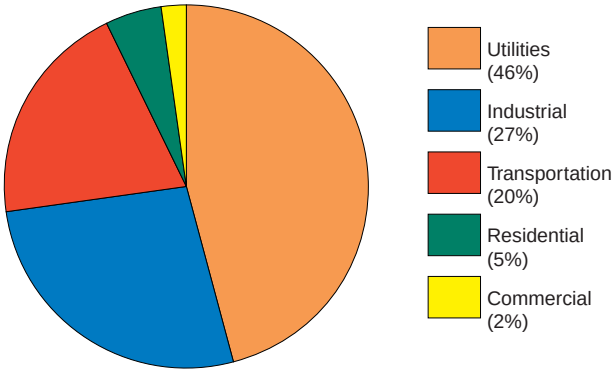
National carbon dioxide concentration trends



* Projected

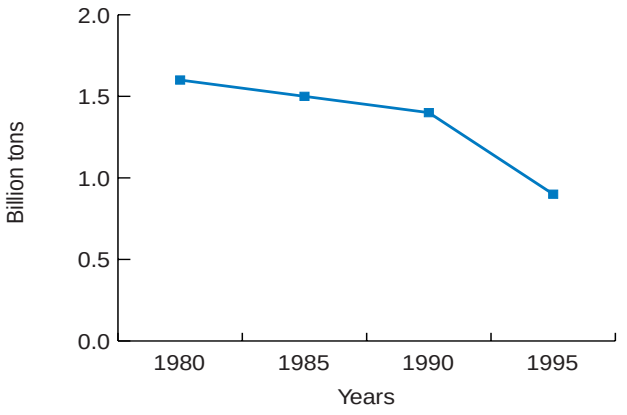
Source: Center for the Study of Carbon Dioxide and Global Change, 1999

Indiana carbon dioxide emissions



Source: IDEM Office of Air Management, 1998

National sulfur dioxide emissions



Source: U.S. Environmental Protection Agency, Acid Rain Program Emissions Scorecard, 1995

Indiana State of the Environment Report

Water Quality

Photo by Richard Fields, Indiana Department of Natural Resources.

Clean water is a precious resource that Hoosiers do not take for granted, whether studying water ecology at the Falls of the Ohio State Park in southern Indiana, sailing on Lake Monroe or drinking from a well on a northern Indiana farm.

Water quality

Water pollution

Water sustains life, supports commerce and agriculture, and provides recreation and enjoyment. We depend on both surface and ground water for our drinking water. Indiana's beaches, rivers and lakes are popular destinations for recreation. Industry and commerce rely on Indiana's plentiful water supply to make steel, electricity and many other products.

Every time it rains or the snow melts, water carries pollutants from the air and land into surface and ground water. Some pollutants break down in the environment, but others persist and accumulate in fish, shellfish and other aquatic organisms or become trapped in river and lake beds for many years.

Water pollution sources are classified as point or nonpoint. Point sources of pollution have a known discharge point such as a pipe or sewer. An example of a point source discharger is an industrial wastewater treatment plant that discharges treated water directly into a stream.

Nonpoint source pollution refers to water pollution that results from activities such as soil erosion, agriculture, urban runoff, land development and air pollution deposits. Nonpoint pollution sources are often challenging to identify, measure and control.

Ground water-Water found below the surface where holes, cracks and spaces between rocks and soil are filled with water.

Surface water-Natural and artificial accumulations of water on the land surface.

Indiana's most harmful water pollutants

- Pathogens such as *E. coli*
- Oxygen-depleting nutrients such as fertilizers, untreated sewage and manure
- Chemical contaminants such as polychlorinated biphenyls, pesticides and metals
- Siltation from soil erosion

Typical contamination sources

- Municipal point sources
- Agricultural activities
- Industrial point sources
- Combined sewer overflows
- Resource extraction
- Habitat alterations
- Land disposal (landfills and land application of sewage sludge)

for more details visit water @ www.state.in.us/idem/soe/99report/water

Drinking water

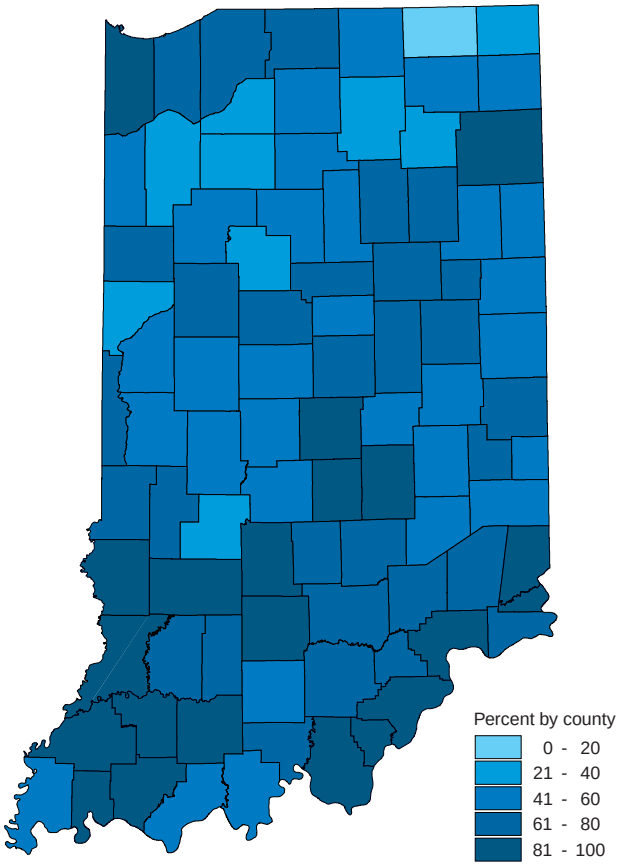
Seventy-five percent of Hoosiers get their drinking water from community public water supply systems, up from 70 percent in 1970. As might be expected, Hoosiers living in urban areas are more likely to use public drinking water than those in rural areas who are more likely to use private wells.

Public drinking water systems in Indiana

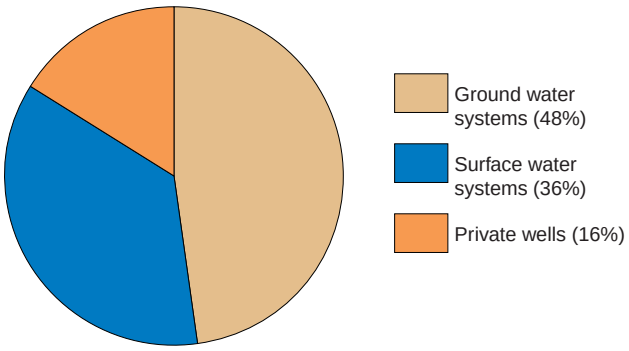
Indiana has more than 4,000 active community public water supply systems. These range from large community systems serving urban areas to small, seasonal campgrounds and include the approximately 900 public drinking water systems that serve residential and commercial customers year-round.

Indiana's community water systems obtain their water from ground water sources via wells or surface water sources such as lakes, rivers or reservoirs. Eighty percent of the community water systems in Indiana obtain their water from ground water sources. The remaining 20 percent of community water systems, including many of Indiana's largest urban areas, draw from surface water.

Households served by public drinking water supply systems



Households served by system type



Source: IDEM Office of Water Management, 1998

Threats to drinking water

Contaminants can enter drinking water supplies from various sources. For example, contaminants can move from the land into ground water or be carried to lakes and streams. During rainfall, combined sewers may discharge untreated sewage into rivers that are sources for drinking water. Community public water suppliers must properly treat and disinfect water which may contain bacteria and nitrates. These contaminants pose the most immediate health risks.

Violations of drinking water standards

The U.S. Environmental Protection Agency (EPA) has established drinking water standards for 77 contaminants.[†]

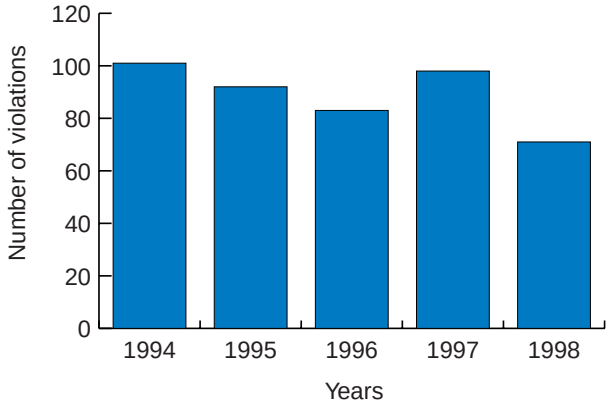
If a public water system exceeds a standard, fails to properly treat or does not test according to schedule, the water supplier must notify its customers of the violation and work to correct the problem.

In 1998, 93 percent of the 891 community public water systems met all drinking water health standards. This is an improvement of four percentage points from 1997. Bacteria was the most common contaminant found in the 62 noncompliant systems.

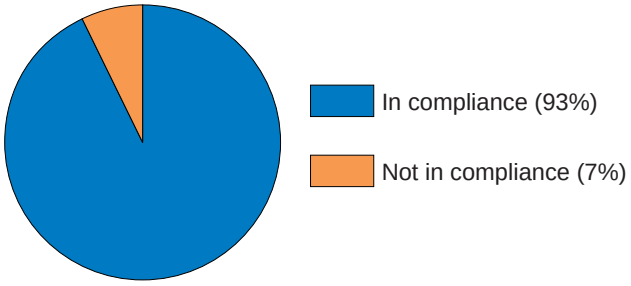
Two consecutive periods of the same violation, such as a nitrate or a bacteria violation, a system in significant noncompliance. In 1994, over 450,000 people in Indiana obtained drinking water from systems in significant noncompliance. This number has dropped dramatically since then, and in 1998, less than 12,000 people were served by systems in significant noncompliance.

[†] The number of EPA drinking water standards for contaminants was reported incorrectly in the *1998 State of the Environment Report* as 73. The correct number is 77.

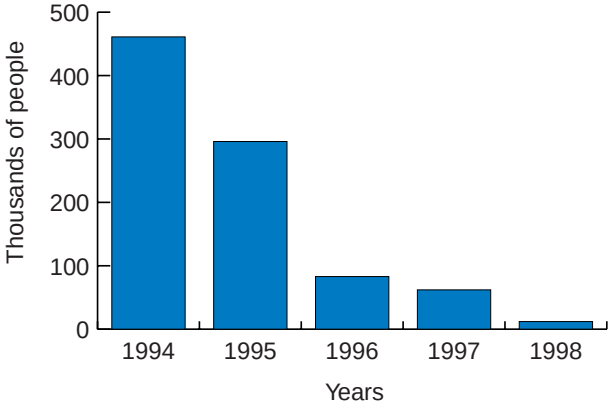
Drinking water standard violations
Community public water supply systems



1998 drinking water standards compliance
Community public water supply systems



Population served by systems in significant noncompliance



Source: IDEM Office of Water Management, 1998

Ground water

Ground water is the water found below the surface where holes, cracks and spaces between rocks and soil are filled with water. Forty-eight percent of the population served by public drinking water systems depends on ground water. In addition to public water systems, more than 500,000 Indiana homes use private wells and ground water systems for their water supply.

Ground water also supports Indiana's economy as a source of water for industrial and agricultural uses. In 1998, Indiana used approximately 250 billion gallons of ground water, 10 percent more than in 1986.

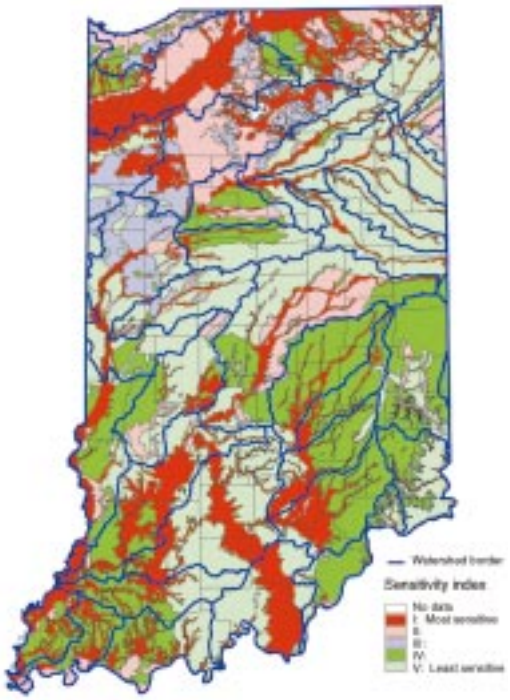
Ground water highly susceptible to contamination

Once contaminated, ground water is difficult to clean, requiring many years and great expense. Protecting ground water from possible pollution sources makes more sense.

Some ground water is more susceptible to contamination because of the kind of soils and rocks above it. In some cases, the ground water is so close to the surface that pollutants do not have far to travel. In other cases, soils above the ground water are porous and pollutants can move quickly.

Ground water sensitivity indexes, such as the map to the right, are valuable tools in source water assessments for community public water supply systems. Ground water sensitivity indexes help define the relationship between geology and ground water and provide a better understanding of the flow system between ground and water.

Ground water sensitivity index



This map is a work in progress between IDEM and the Indiana Geological Survey.

Source: Indiana Geological Survey, 1998

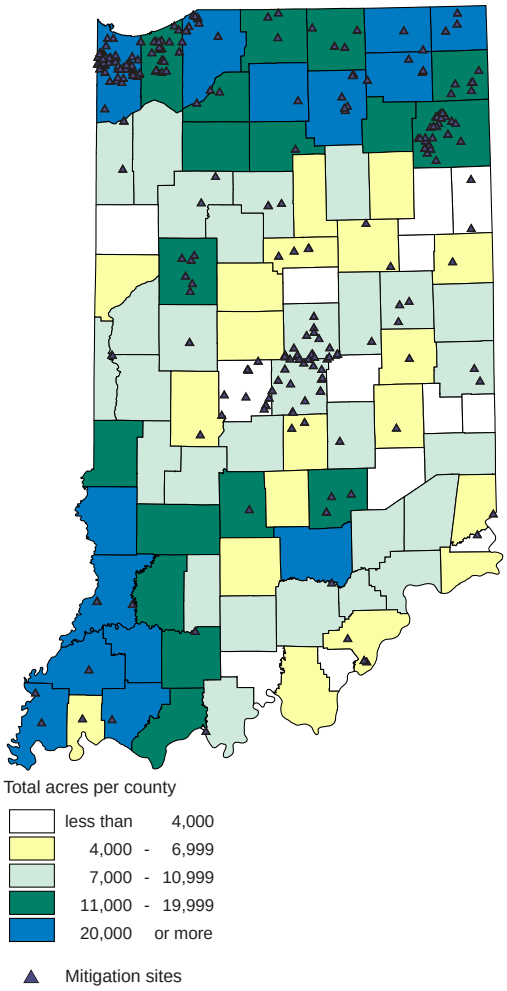
Wetlands

Wetlands are areas of land that typically are wet or flooded part of the year, have soils formed under wet conditions and support vegetation suited for life in saturated soil conditions. Wetlands are important because they improve water quality, provide flood protection, shoreline erosion control and habitats for fish and wildlife. When European settlers arrived, Indiana had an estimated 5.6 million acres of wetlands. Since then, more than 85 percent of Indiana's wetland acreage has been drained and converted to farmland and urban areas.

Wetland mitigation

Wetland mitigation is the creation or restoration of a wetland to counter the loss of wetland acreage and function. In January 1998, IDEM and EPA initiated a series of studies to evaluate wetland regulation and mitigation, identify potential problems and formulate solutions. Interim results reveal construction status for 296 mitigation sites required between 1986 to 1996. During this time period, 190 mitigation sites had been constructed, 62 sites had been partially constructed, and no action had been taken on 44 sites.

Indiana wetlands



Source: Indiana Water Quality Report (acres), 1998; Construction Rate of Wetland Compensatory Mitigation in Indiana (mitigation sites), 1998

Surface water quality

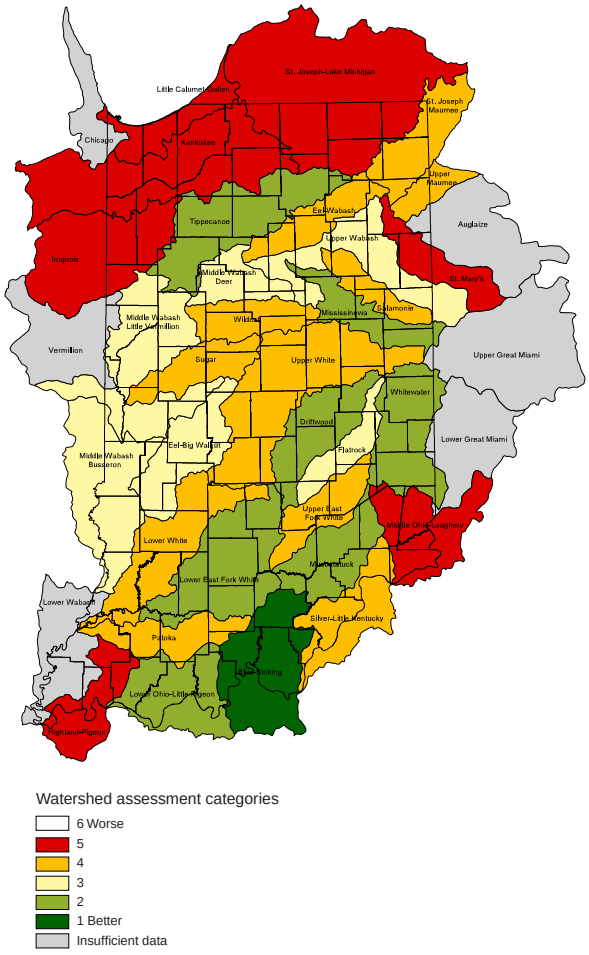
Indiana is divided into 41 watersheds, many of which extend into neighboring states. These watersheds contain approximately 36,000 stream miles and drain into the state's nine major drainage basins. Also, more than 600 publicly owned inland lakes and reservoirs cover more than 106,000 acres within the basins. The quality of the waterways varies greatly from severely degraded by pollution to clean enough for fishing, swimming or for use as a drinking water supply.

Surface water data used in this report

Indiana streams and lakes are monitored year-round and assessed every five years. The Surface Water Quality Monitoring Strategy (revised 1998) is designed to provide technical data and information for identifying impaired streams and lakes in Indiana. Section 305(b) of the Clean Water Act requires states to prepare and submit a water quality assessment report of state water resources every two years. The most recently published report is the *Indiana 305(b) Report, 1994-95*. 1996 and 1997 information was submitted to EPA in 1998.

In 1998, IDEM's Office of Water Management and the Natural Resources Conservation Service led the first Unified Watershed Assessment (UWA) of Indiana watersheds. The results of this assessment identify Indiana watersheds that do not meet Clean Water Act or other natural resource goals. Data from the UWA, the Surface Water Quality Monitoring Strategy and other sources are used to assess the basins, watersheds, streams and lakes profiled on the following pages in this chapter.

Indiana watersheds



Source: IDEM Office of Water Management, 1999

Watershed
A land area that drains into a lake or river and its tributaries.

Basin
A large watershed or group of watersheds such as the Great Lakes and Ohio River basins.

For the purposes of this *1999 State of the Environment Report*, basins within the state highlight groups of individual watersheds.

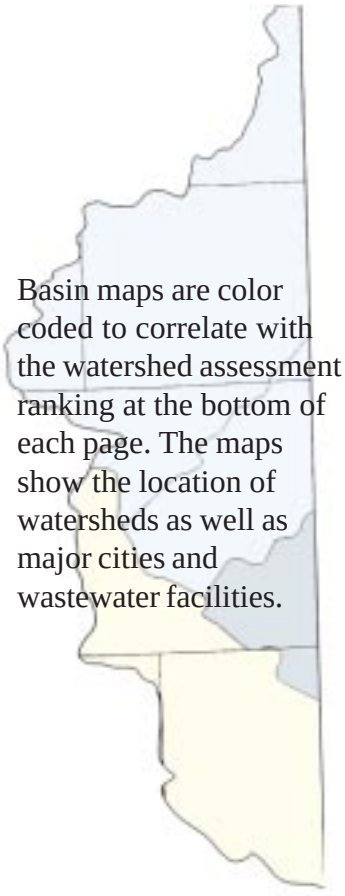
Guide to the assessment of the basins

Use this page as a general guide to the nine basin summaries that follow. The introduction on each page describes the basin's location and its main tributaries.

Major wastewater facilities

Each page shows the number and location of large facilities permitted to discharge to surface waters within the basin.

- Electrical-Large power plants that generate electricity and require water for cooling.
- Government-Major state or federally owned sites such as correctional facilities and military bases.
- Industrial-Major industries with significant amounts of wastewater treatment discharge.
- Municipal-Major wastewater treatment plants that discharge more than 1 million gallons per day.



Basin maps are color coded to correlate with the watershed assessment ranking at the bottom of each page. The maps show the location of watersheds as well as major cities and wastewater facilities.

Basin quality rating

Aquatic life support (% of total stream miles assessed for aquatic life support)

Provides suitable water quality for protection and propagation of desirable aquatic life.

Does not provide suitable water quality for protection and propagation of desirable aquatic life.

Recreational uses (% of total stream miles assessed for recreational uses)

People can swim in water without risk of adverse health effects, such as catching a waterborne disease from raw sewage contamination.

People swimming in water risk adverse health effects, such as catching a waterborne disease from raw sewage contamination.

Watersheds assessment ranking key

Watershed	Total miles	Miles assessed	Overall quality
Watershed Name	xx	xx	1 2 3 4 5 6
			Better ——— Worse

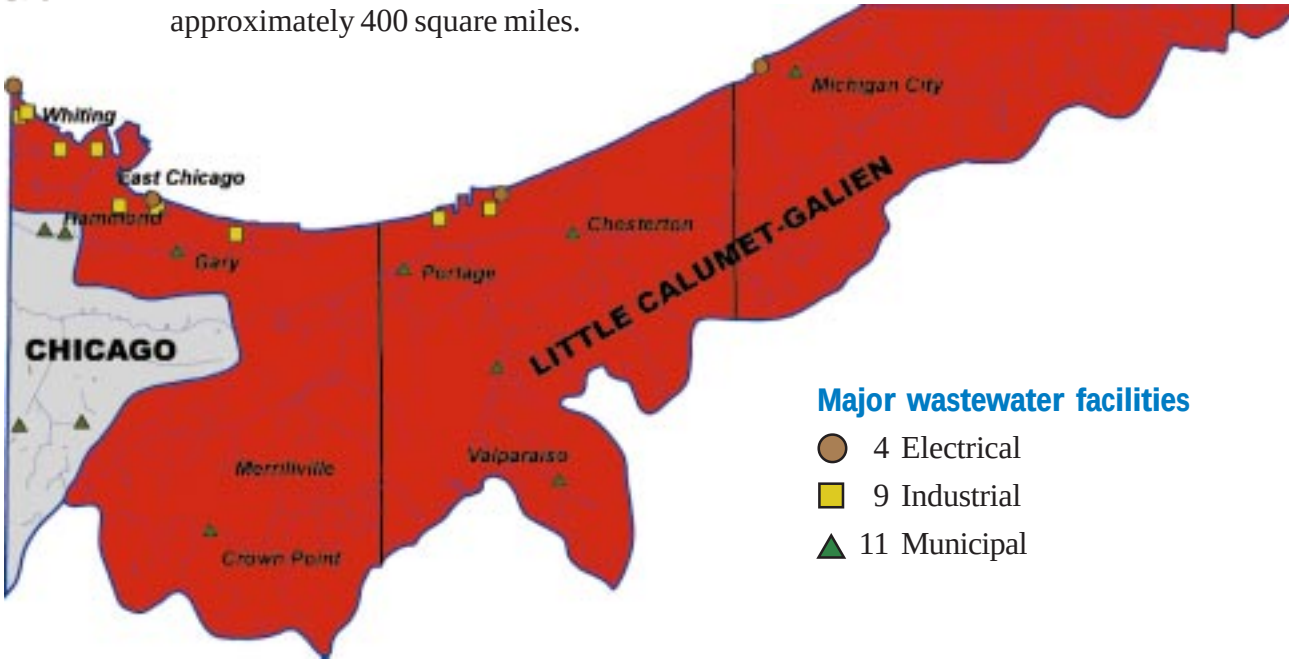
The information in this report reflects an ongoing significant data gathering, coordination and analysis effort by IDEM. Information sources include IDEM and many local, state and federal agencies. With each new year, we are closing the data gap to provide a more comprehensive picture of the state of Indiana's water quality.

Overall basin quality is determined by using data from the Unified Water Assessment of Indiana Watersheds, the Surface Water Quality Monitoring Strategy and other data sources. Basin quality is rated on a scale of 1 to 6, with 1 being better quality and 6 being worse quality. Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Lake Michigan Basin (Northwest Indiana)

The Lake Michigan Basin is located in northwestern Indiana and drains portions of Lake, Porter and LaPorte counties. The drainage area within Indiana is approximately 400 square miles.

The Grand Calumet River-Indiana Harbor Ship Canal, Trail Creek and Little Calumet River are the major tributaries in the basin. For purposes of this evaluation, Lake Michigan was rated separately.



Major wastewater facilities

- 4 Electrical
- 9 Industrial
- 11 Municipal

Basin quality rating*

Aquatic life support (26% assessed)

50%

50%

Recreational uses (25% assessed)

34%

66%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

Better 1 2 3 4 5 6 Worse

Watershed	Total miles	Miles assessed	Overall quality*	1997	1998
Little Calumet-Galien	574	124		5	5
Chicago	40	4		5	NA

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.
Source: Indiana 303(d) List and 305(b) Update, 1998

St. Joseph River Basin

The St. Joseph River Basin is located in northern Indiana and drains portions of Elkhart, Kosciusko, LaGrange, Noble, St. Joseph and Steuben counties. The drainage area within Indiana is approximately 1,800 square miles.

The St. Joseph, Elkhart and Little Elkhart rivers and Turkey and Pigeon creeks are the major tributaries in the basin.

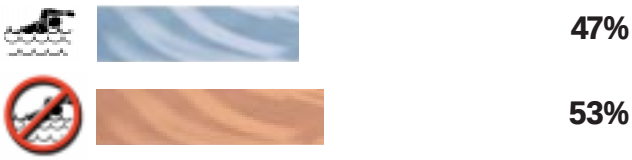
Major wastewater facilities

- 1 Industrial
- 8 Municipal

Basin quality rating*

Aquatic life support **(7% assessed)**

Recreational uses **(7% assessed)**



Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better — Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
St. Joseph-Lake Michigan	1,350	101	4	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.
Source: Indiana 303(d) List and 305(b) Update, 1998

Maumee River Basin

The Maumee River Basin is located in northeastern Indiana and drains portions of Adams, Allen, DeKalb, Noble, Steuben and Wells counties. The drainage area within Indiana is approximately 1,200 square miles.

The Maumee, St. Joseph and St. Mary's rivers are the major tributaries in the basin.

Major wastewater facilities

- 2 Industrial
- 3 Municipal

Basin quality rating*

Aquatic life support **(11% assessed)**

71%

29%

Recreational uses **(11% assessed)**

81%

19%

Source: Indiana 303(d) List and 305(b) Update, 1998

1 2 3 4 5 6
Better — Worse

Watersheds assessment ranking

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
St. Joseph-Maumee	678	71	4	4
Upper Maumee	292	44	4	4
St. Mary's	337	37	4	5
Auglaize	117	0	NA	NA

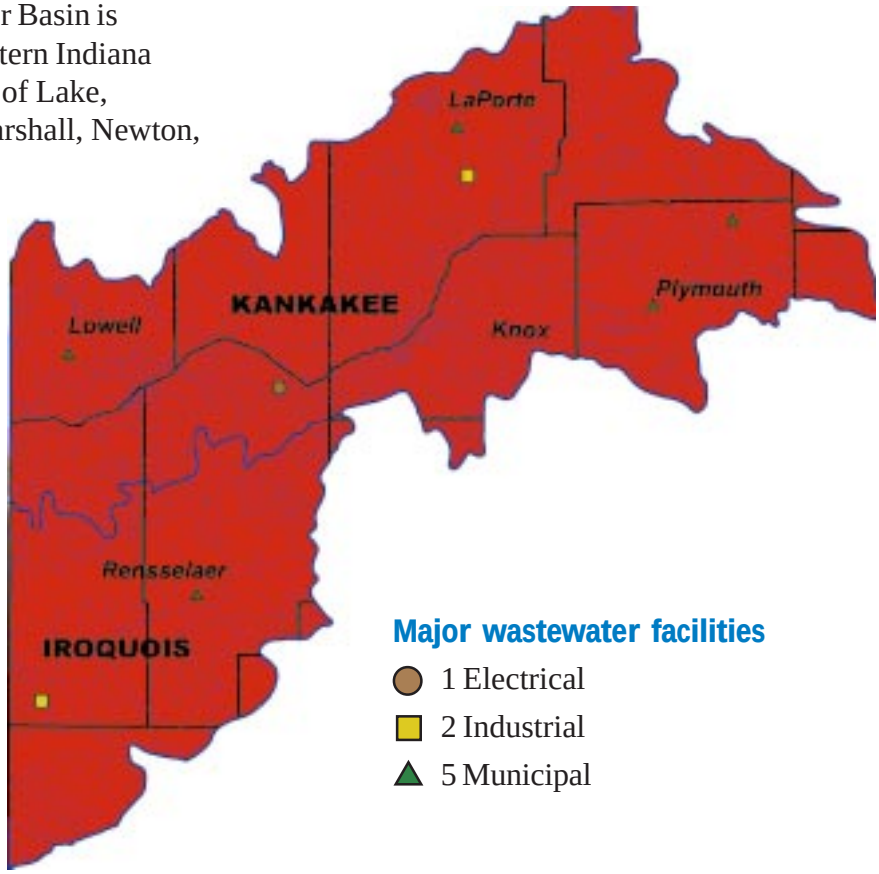
*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Kankakee River Basin

The Kankakee River Basin is located in northwestern Indiana and drains portions of Lake, Jasper, LaPorte, Marshall, Newton, Porter, Starke, and St. Joseph counties. The drainage area within Indiana is approximately 3,000 square miles.

The Kankakee, Iroquois and Yellow rivers are the major tributaries in the basin.



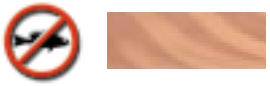
Major wastewater facilities

- 1 Electrical
- 2 Industrial
- 5 Municipal

Basin quality rating*

Aquatic life support **(3% assessed)**

62%



38%

Recreational uses **(3% assessed)**

44%

56%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better — Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Kankakee	2,646	94	4	5
Iroquois	857	4	3	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

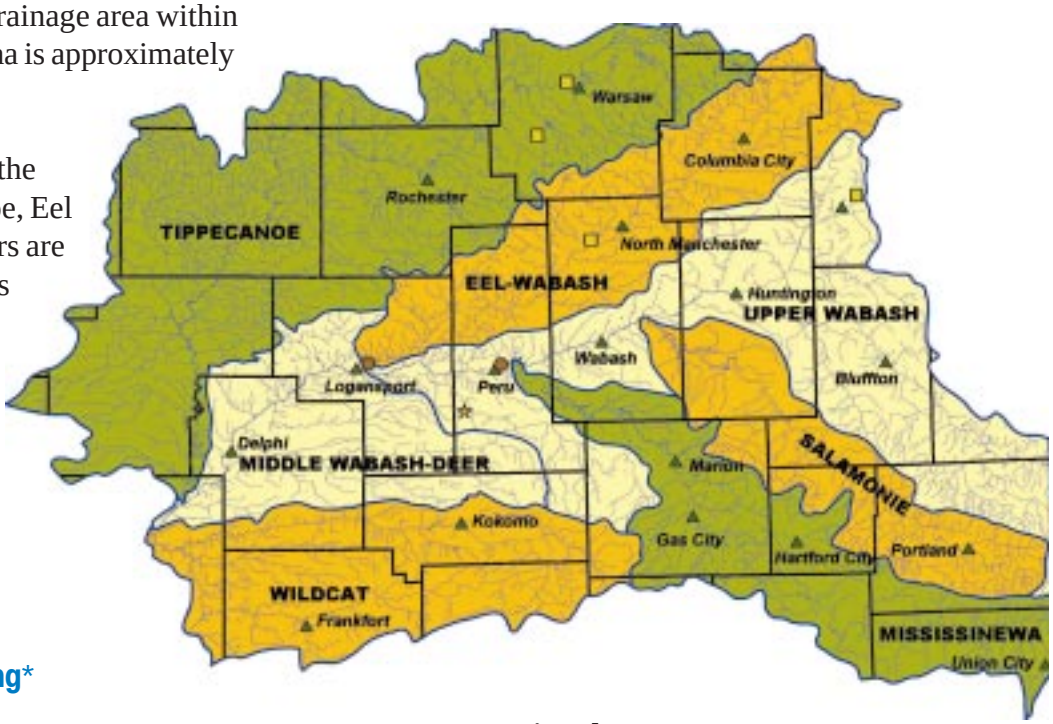
Upper Wabash River Basin

The Upper Wabash River Basin drains portions of 25 counties, including Fulton, Grant, Pulaski, Tippecanoe, Wabash, and White. The drainage area within Indiana is approximately 6,900 square miles.

Wildcat Creek and the Wabash, Tippecanoe, Eel and Salamonie rivers are the major tributaries in the basin.

Major wastewater facilities

- 4 Electrical
- 4 Industrial
- 1 Government
- 18 Municipal



Basin quality rating*

Aquatic life support (14% assessed)

91%

9%

Recreational uses (0% assessed)

N/A

N/A

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better — Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Eel-Wabash	757	101	4	4
Upper Wabash	968	255	4	3
Salamonie	359	119	3	4
Mississinewa	467	181	4	2
Tippecanoe	2,082	86	4	2
Middle Wabash-Deer	642	75	4	5
Wildcat	682	104	4	5

*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Lower Wabash River Basin

The Lower Wabash River Basin drains portions of 19 counties, including Montgomery, Clinton, Fountain and Vigo. The drainage area within Indiana is approximately 7,200 square miles.

The Wabash, Patoka and Little Vermilion rivers and Sugar and Busseron creeks are the major tributaries in the basin.

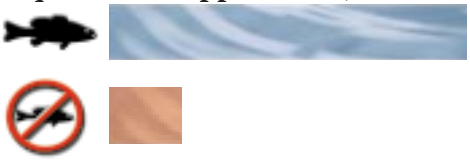
Major wastewater facilities

2 Electrical 10 Municipal

12 Industrial

Basin quality rating*

Aquatic life support **(23% assessed)**



87%

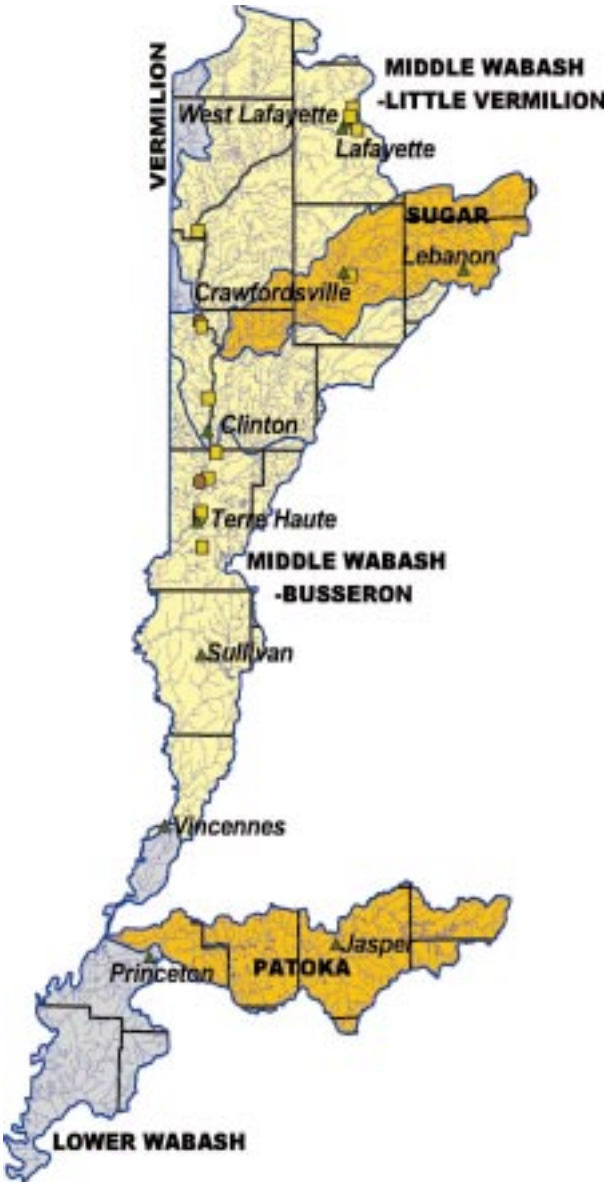
13%

Recreational uses **(4% assessed)**

100%

0%

Source: Indiana 303(d) List and 305(b) Update, 1998



Watersheds assessment ranking

Better 1 2 3 4 5 6 Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
M. Wabash-L.Vermilion	2,298	185	4	3
Sugar	840	93	4	4
M. Wabash-Busseron	795	100	4	3
Patoka	657	657	4	4
Vermilion	134	20	NA	NA
Lower Wabash	457	122	NA	NA

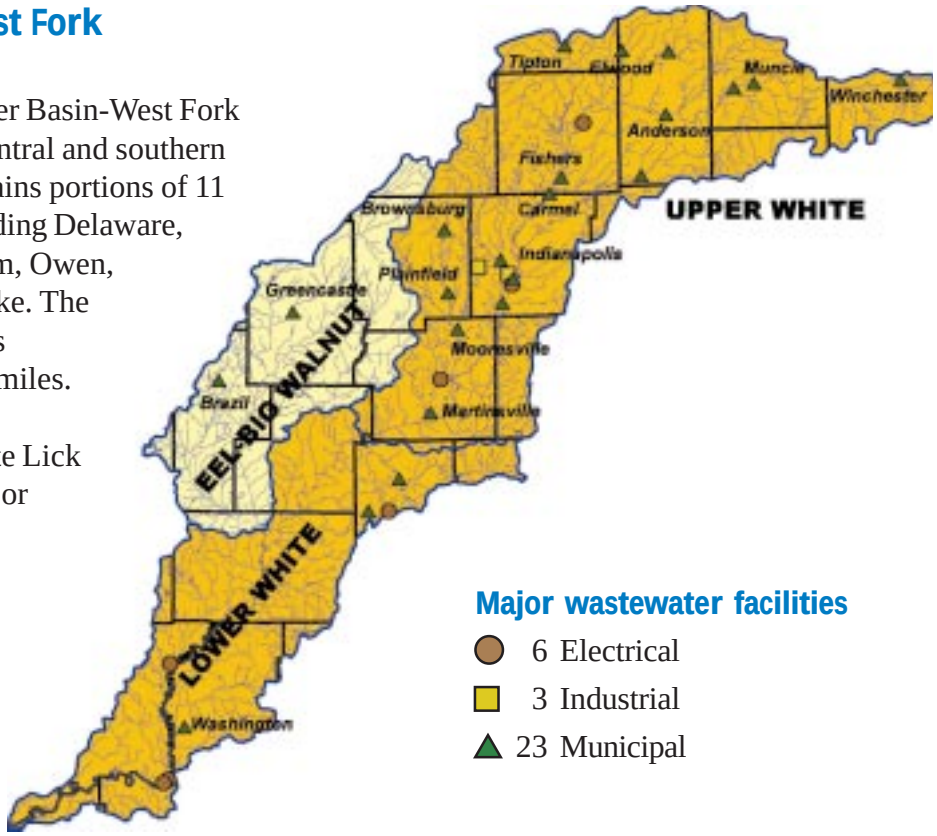
*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

White River Basin - West Fork

The White River Basin-West Fork is located in central and southern Indiana and drains portions of 11 counties, including Delaware, Marion, Putnam, Owen, Daviess and Pike. The drainage area is approximately 5,600 square miles.

The Eel River and Fall, White Lick and Eagle creeks are the major tributaries in the basin.

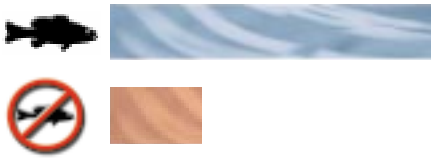


Major wastewater facilities

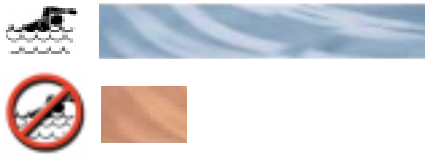
- 6 Electrical
- 3 Industrial
- 23 Municipal

Basin quality rating*

Aquatic life support (100% assessed)



Recreational uses (77% assessed)



Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

1 2 3 4 5 6
Better — Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Upper White	1,755	1,755	4	4
Eel-Big Walnut	794	794	3	3
Lower White	1,132	1,132	4	4

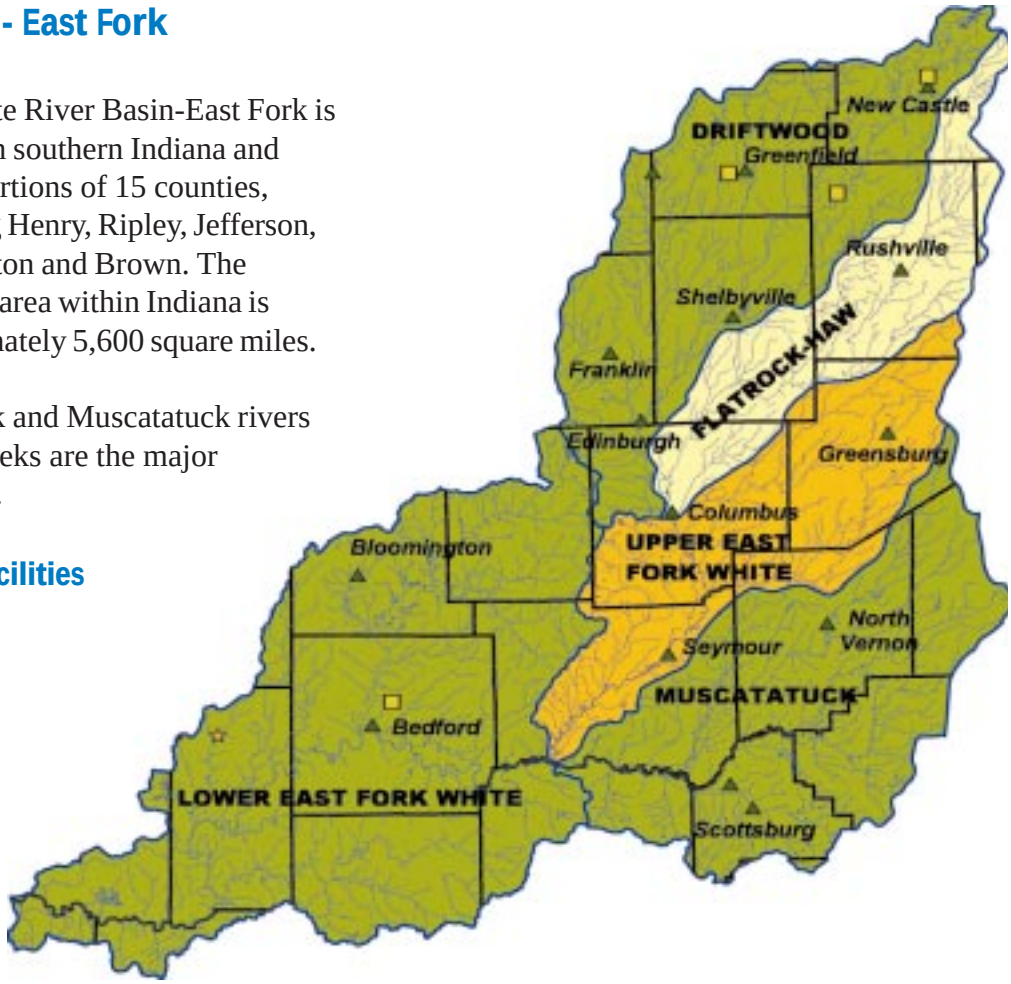
*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

White River Basin - East Fork

The White River Basin-East Fork is located in southern Indiana and drains portions of 15 counties, including Henry, Ripley, Jefferson, Washington and Brown. The drainage area within Indiana is approximately 5,600 square miles.

The Big Blue, Flatrock and Muscatatuck rivers and Salt and Sugar creeks are the major tributaries of the basin.



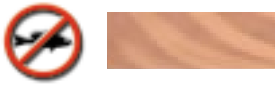
Major wastewater facilities

- ★ 1 Government
- ■ 4 Industrial
- ▲ 15 Municipal

Basin quality rating*

Aquatic life support (15% assessed)

59%



41%

Recreational uses (1% assessed)

0%

100%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

Better 1 2 3 4 5 6 Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Driftwood	787	226	3	2
Flatrock-Haw	457	52	3	3
Upper East Fork White	631	145	4	4
Lower East Fork White	1,403	182	4	2
Muscatutuck	953	62	3	2

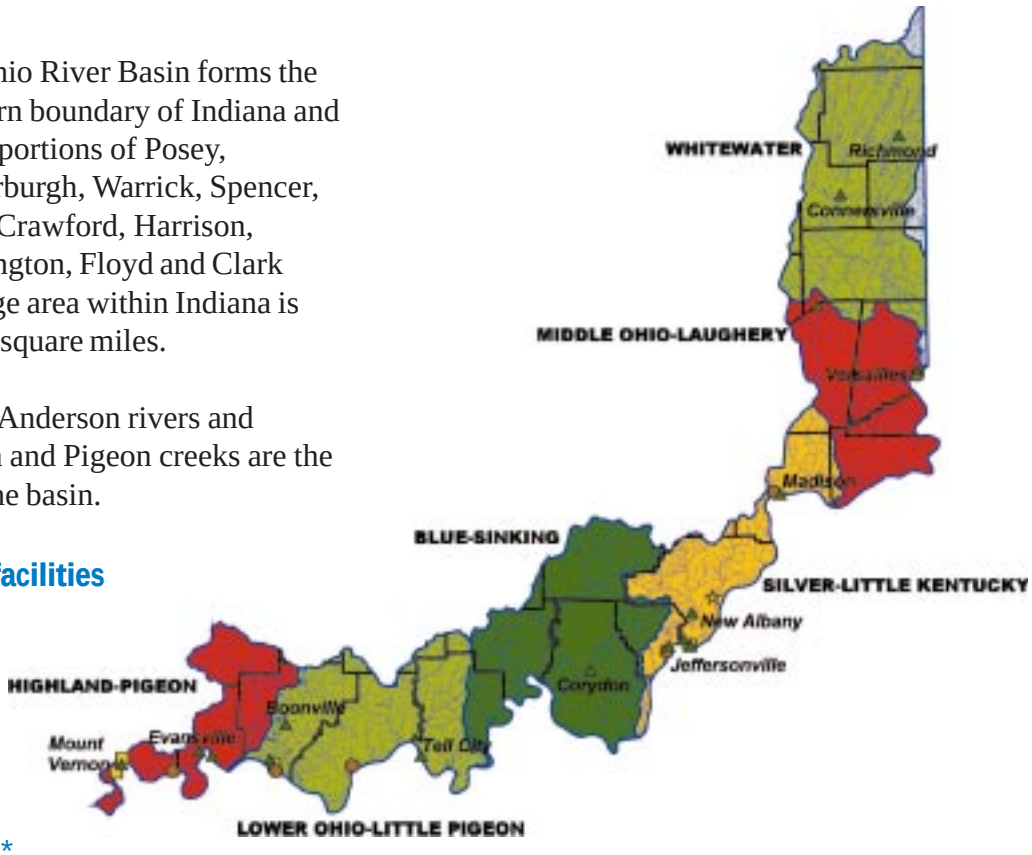
*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Ohio River Basin

The Ohio River Basin forms the southern boundary of Indiana and drains portions of Posey, Vanderburgh, Warrick, Spencer, Perry, Crawford, Harrison, Washington, Floyd and Clark counties. The drainage area within Indiana is approximately 5,800 square miles.

The Ohio, Blue, and Anderson rivers and Laughery, Big Indian and Pigeon creeks are the major tributaries in the basin.



Major wastewater facilities

- 6 Electrical
- 1 Government
- 5 Industrial
- 16 Municipal

Basin quality rating*

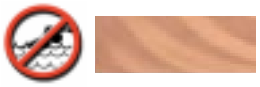
Aquatic life support (20% assessed)

87%

13%

Recreational uses (18% assessed)

60%



40%

Source: Indiana 303(d) List and 305(b) Update, 1998

Watersheds assessment ranking

Better 1 2 3 4 5 6 Worse

Watershed	Total miles	Miles assessed	Overall quality* 1997	1998
Whitewater	1,297	538	3	2
Middle Ohio-Laughery	719	0	NA	5
Silver-Little Kentucky	549	12	3	4
Blue-Sinking	862	78	3	1
Lower Ohio-Little Pigeon	773	5	4	2
Highland-Pigeon	389	42	4	5

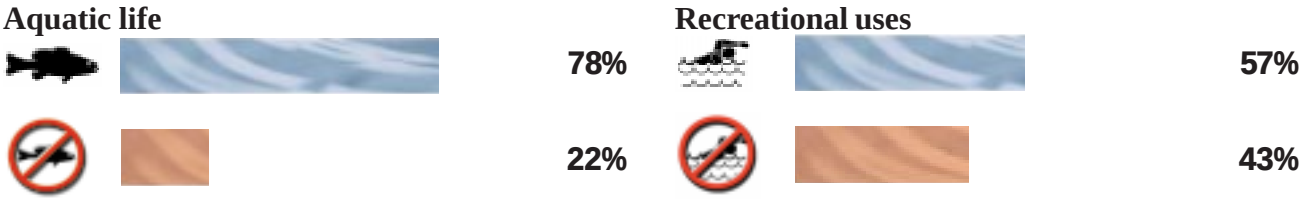
*Changes in basin quality ratings are due, in most part, to improved analysis and increased data availability.

Source: Indiana 303(d) List and 305(b) Update, 1998

Indiana's rivers and streams

As of 1997, IDEM has assessed more than 40 percent of the state's total stream miles for the water's ability to support fish, shellfish and other aquatic life. A majority of that water was found to be supportive; however, a significant amount of Indiana stream miles was determined unsafe for swimming due to frequent high levels of *E. coli* bacteria.

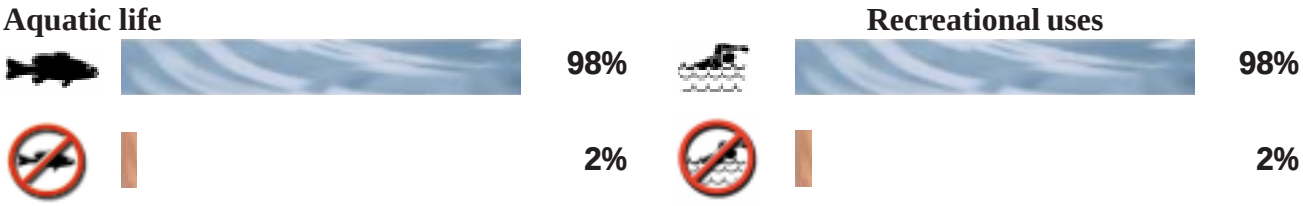
Basin quality rating*



Indiana's lakes

IDEM has assessed nearly every acre of Indiana's lakes and reservoirs for their ability to support swimming and aquatic life. All Indiana lakes are designated for full body contact use and full aquatic life support. Nearly all lakes and reservoirs support their designated uses.

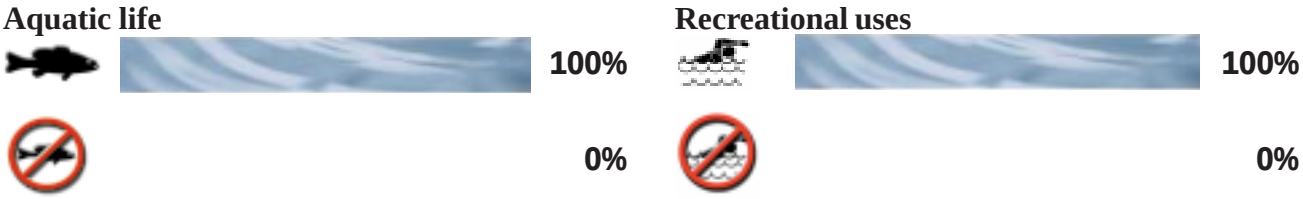
Basin quality rating



Lake Michigan

IDEM has assessed Lake Michigan for physical, chemical and biological information. Every mile fully supported recreational and aquatic life uses. Lake Michigan is designated for full body contact use and full aquatic life support.

Basin quality rating

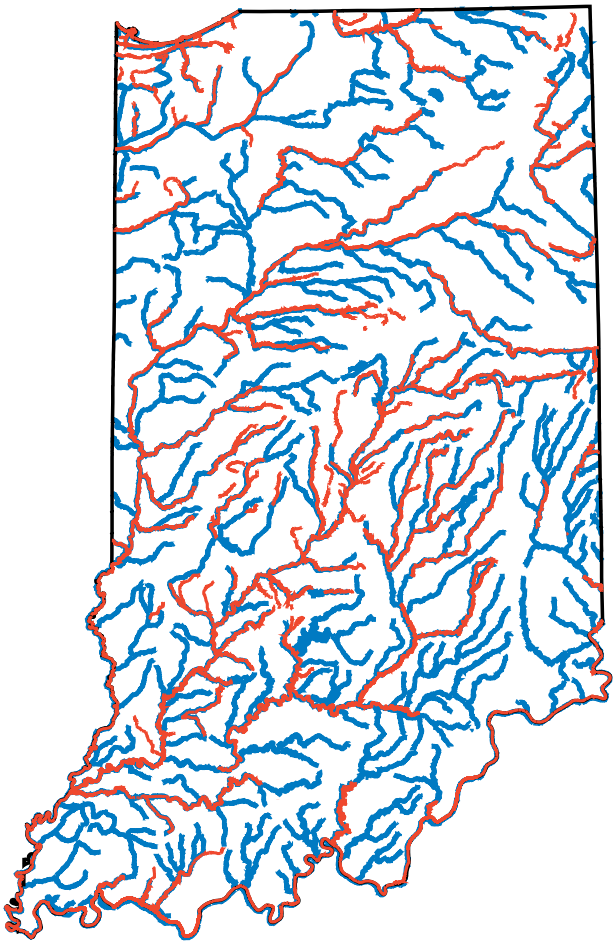


*Changes in basin quality ratings for Indiana's rivers and streams are due, in most part, to improved analysis and increased data availability.
Source: Indiana 303(d) List and 305(b) Update, 1998

Indiana's impaired rivers and lakes

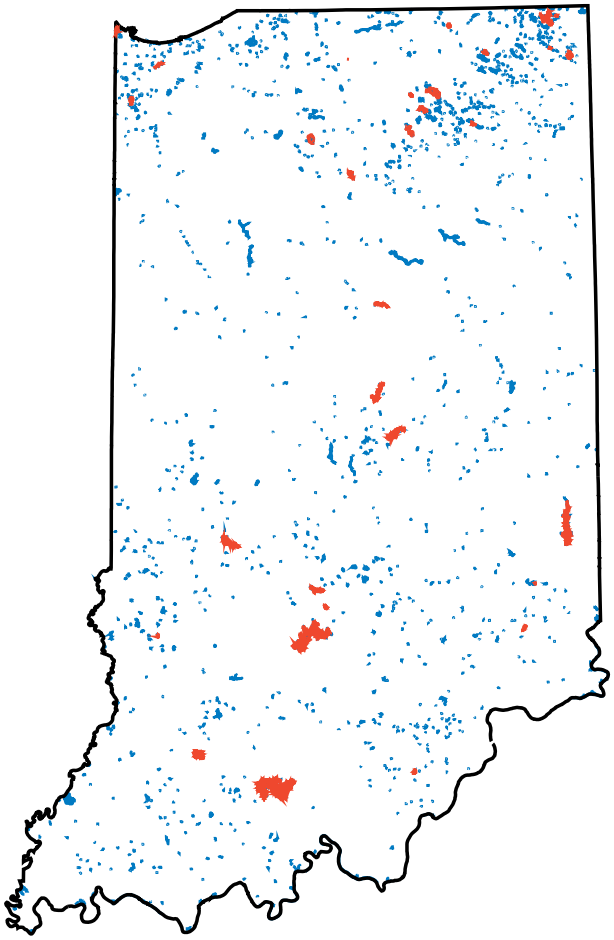
The maps show Indiana's 208 impaired rivers and lakes. In accordance with the Surface Water Monitoring Strategy, IDEM performs sampling, analysis and assessment of each basin once every five years.

The impaired rivers and lakes do not meet Indiana's water quality standards for designated uses or other natural resource goals, such as aquatic life support, fish consumption and recreational use.



Impaired rivers and streams

Unimpaired rivers and streams



Impaired lakes

Unimpaired lakes and reservoirs

Source: IDEM Office of Water Management, 1998

Indiana State of the Environment Report

Land Quality

Photo by Richard Fields, Indiana Department of Natural Resources.

Hoosiers want our land to be free from unsafe chemicals and waste. Whether taking on the challenge of a fresh blanket of snow–a skier's delight–at the Upper Cascades Park in Bloomington, playing at an Evansville playground, plowing fields or working in an industrialized area in any part of the state, our land must be clean and safe for human activities and natural enjoyment.

Land quality

Indiana terrain

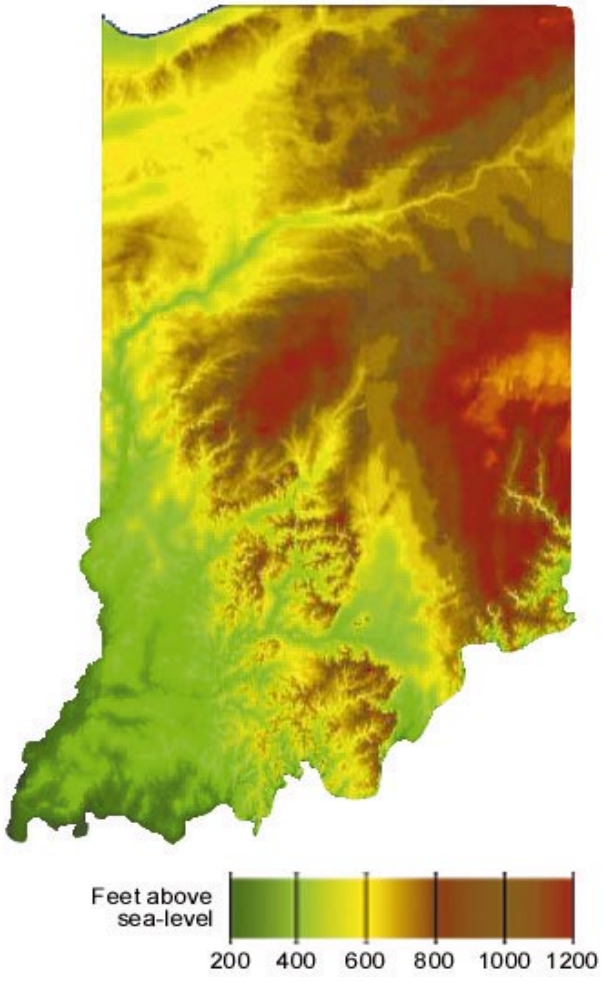
Indiana covers an area of 36,300 square miles, of which 99 percent is land. Indiana's topography ranges from 324 to 1,257 feet above sea level. The lowest point of elevation is in the southwest corner of Indiana, where the Wabash River flows into the Ohio River. The highest point is in Wayne County in east central Indiana in an open field, marked by a small pile of stones.

Past waste management practices have caused many significant problems that the state must continue to address, including contaminated sites, leaking underground storage tanks, spills, landfills and open dumps that contaminate ground water.

Thousands of contaminated Indiana properties require cleanup. Many are actively under investigation or cleanup. Others are yet to be discovered.

Once identified, contaminated sites are assessed for their potential threat to human health and the environment, which determines the approach taken to clean them up.

Indiana topography



Source: Indiana Geological Survey, 1988

for more details visit land @ www.state.in.us/idem/oce/99report/land

Contaminated sites

Prior to the 1970s, waste disposal was largely uncontrolled. Industries dumped hazardous wastes onto the land and left drums filled with hazardous materials outside to leak and corrode. Garbage was taken to town dumps where it was burned or buried without environmental protection. The result was contaminated sites.

Restoring natural resources

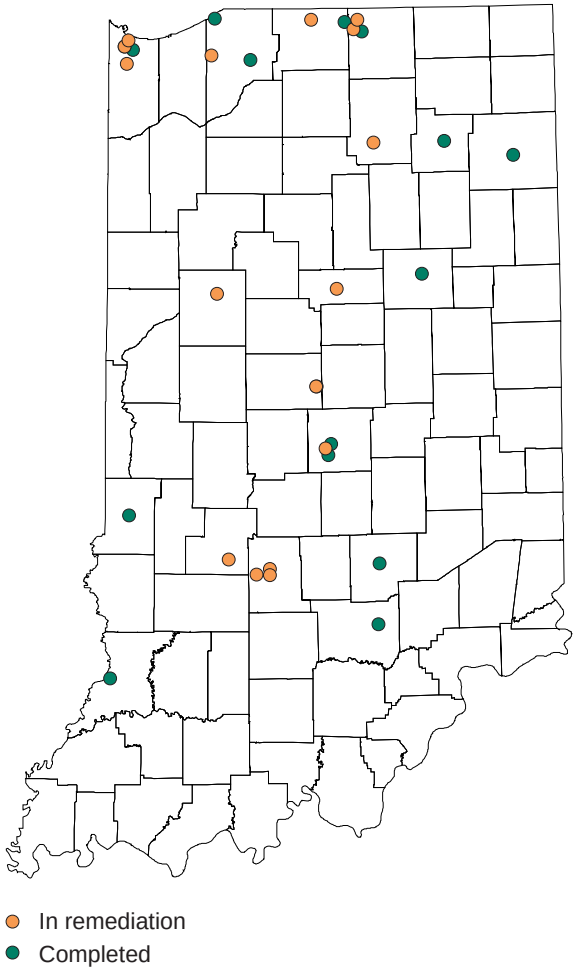
State and federal natural resource trustees assess injury to natural resources at contaminated sites and surrounding areas.

In 1998, more than 650 acres of land were restored or acquired by the Natural Resource Trustees to replace injured resources in Indiana. Since 1997, more than 900 acres of land have been restored or acquired.

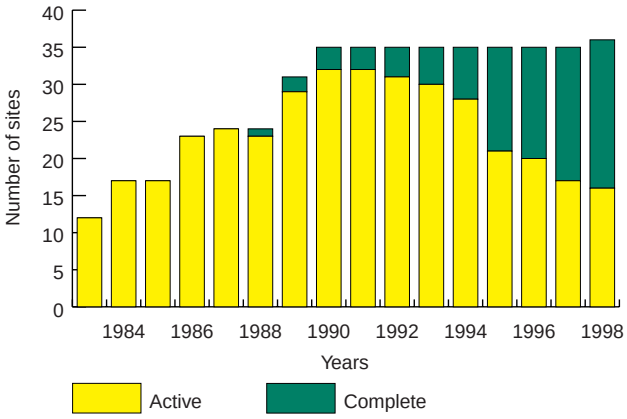
Superfund cleanups

The federal Superfund targets complex, heavily contaminated sites for cleanup, focusing on those sites that pose the greatest health threats. Superfund sites commonly contain soils contaminated by improperly stored or disposed chemicals. Wetlands, ground water, lakes and rivers may be contaminated through soil contact or storm water runoff.

Current cleanups of Superfund sites



Superfund cleanups



Source: IDEM Office of Environmental Response, 1998

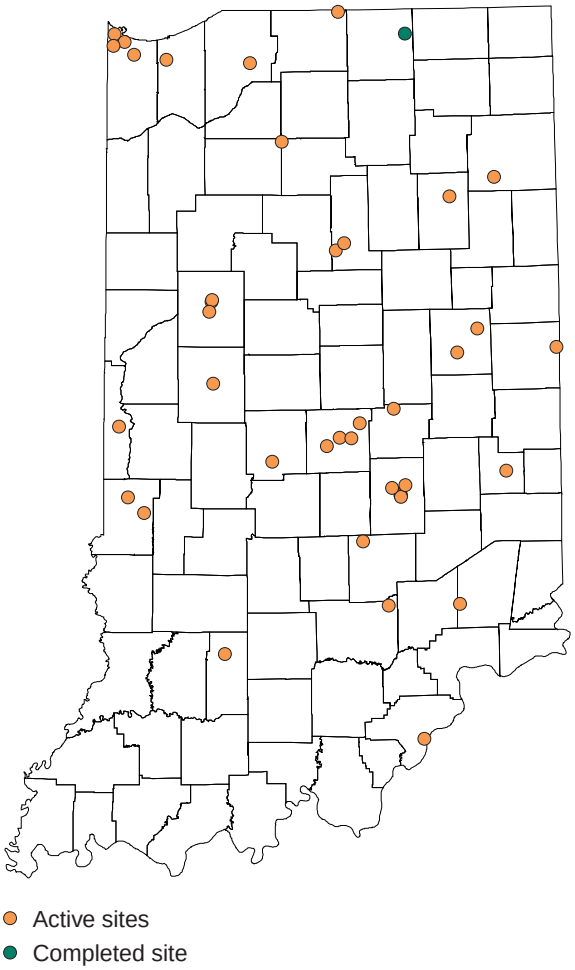
State cleanups

Many sites identified as needing remediation do not qualify as Superfund sites due to the level or nature of the contamination. Of the 61 sites in the state that have been identified for potential action, 21 were under oversight by the State Cleanup Program and one site was completed and closed in 1998. A new program, Response Remediation, was started in 1998 to oversee long-term remedial actions at former emergency response sites. Through this program, 39 additional sites were overseen for remediation in 1998.

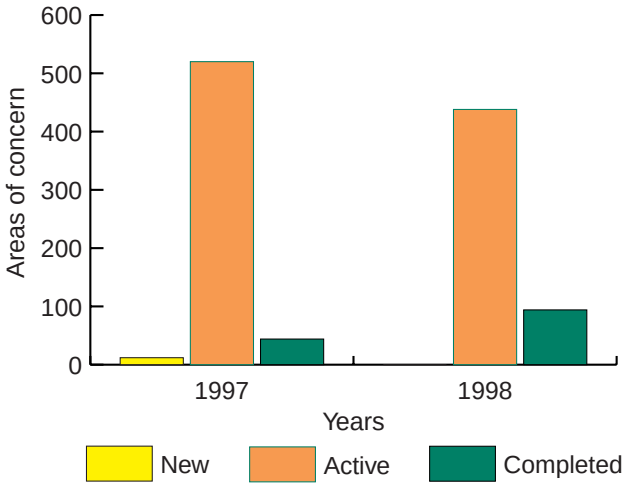
Military cleanups

Under Superfund authority, IDEM oversees and assists the U.S. Department of Defense in the investigation and cleanup of nine active or closing military bases and several other formerly used defense sites in Indiana where hazardous substances were used, stored or disposed. Each installation has many different areas that require cleanup. In 1997, 44 of 576 areas were completed; in 1998, there were 532 areas of concern that necessitated investigation and possible cleanup, 94 of which were completed.† The cleanup and reuse of military properties have created two new state parks, Charlestown and Fort Benjamin Harrison, and a new state correctional facility currently under construction at the former Grissom Air Force Base.

State and military cleanup sites



Military cleanups



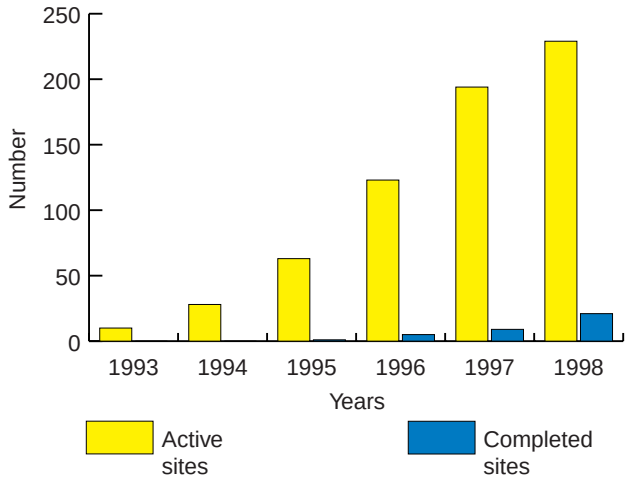
Source: IDEM Office of Environmental Response, 1998

† The number of military cleanup areas for 1997 was reported incorrectly in the *1998 State of the Environment Report* as 528. The correct number is 576.

Voluntary remediation

Indiana's Voluntary Remediation Program enables eligible property owners or other responsible parties to clean up sites quickly and to receive a Covenant Not To Sue for further action from the governor. Since this program's inception in 1993, 266 sites have applied, and 36 sites have been cleaned up. In 1998, there were 229 active projects and 21 completed cleanups, 20 of which received Covenants Not To Sue. The Voluntary Remediation Program allows companies to obtain state concurrence with their independent self-funded cleanup activities.

Voluntary remediation

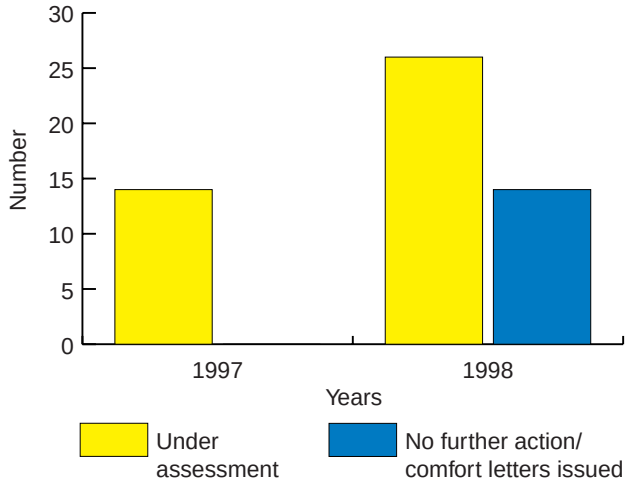


Brownfields redevelopment

Brownfields are abandoned, idled or underused properties where environmental contamination, either real or perceived, hinders reuse. One may be as small as a vacant corner gas station or as large as an abandoned factory. Environmental issues can add cost, time and uncertainty to brownfields redevelopment projects.

Redeveloping brownfields links economic vitality and jobs with environmental protection. Recycling brownfields into productive use discourages urban sprawl, preserves farmlands and open space and revives city neighborhoods. In 1997, IDEM assisted 15 Indiana communities in the redevelopment of 20 sites. By the end of 1998, there were 61 Indiana communities with 63 brownfields sites targeted for redevelopment.

Brownfields redevelopment



Source: IDEM Office of Environmental Response, 1998

Underground storage tanks

Underground storage tanks at gas stations and other businesses are a common source of soil and ground water contamination. Contaminants from leaking underground storage tanks can reach drinking water wells or travel as vapors into sewers and basements, creating explosion danger and threatening human health and the environment. These sites are cleaned up by responsible parties or by IDEM.

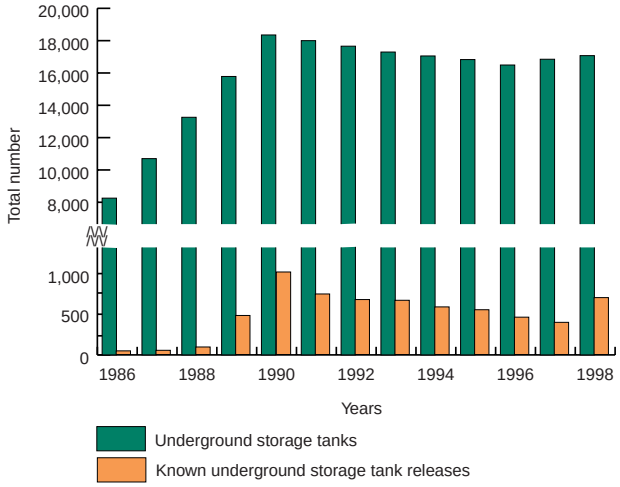
Since 1986, more than 6,500 regulated underground storage tanks have been reported as leaking in Indiana. At the end of 1998, 37 percent of these tanks had been approved for closure cleanup. Approximately 10 percent of all identified leaking tanks were considered significant threats to humans or the environment and were undergoing cleanup.

Only 45 percent of facilities with registered underground storage tanks were in compliance with federal requirements for leak detection, spill and overfill prevention, and corrosion protection by the December 22, 1998, deadline.

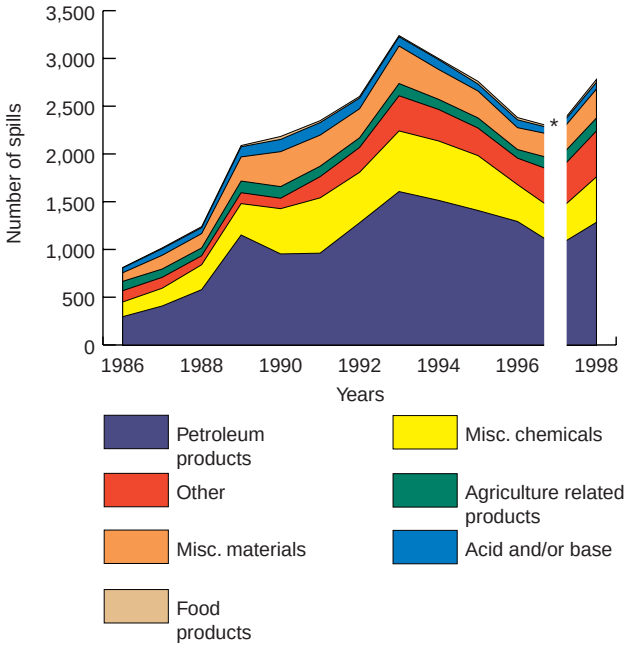
Environmental response

Chemical spills, agricultural waste releases, explosions and other disasters endanger human health and the environment. These threats can expose people to hazardous fumes or liquids or contaminate drinking water supplies. In 1998, more than 2,600 spills were reported, compared to more than 2,100 in 1997. Reported spills are categorized by priority, based on the amount spilled, the toxicity of the substance and the location of the spill. In 1998, 14 percent of all reported spills were categorized as Priority I, the highest priority ranking.

Registered underground storage tanks



Spill reports



*A substantial revision to reporting rules was made in 1997. This resulted in a change of reporting practices and totals

Source: IDEM Office of Environmental Response, 1998

Hazardous waste

Hazardous waste generation

Ignitable, corrosive, reactive or toxic hazardous wastes pose substantial threats to human health and the environment if they are not properly managed.

In 1997, 626 Indiana facilities generated 7.3 million tons of hazardous waste. While this is an 11 percent increase from 1995, manufacturing activities increased 15 percent, more facilities were generating waste, and the economy was producing goods at near capacity.

Hazardous waste treatment and disposal

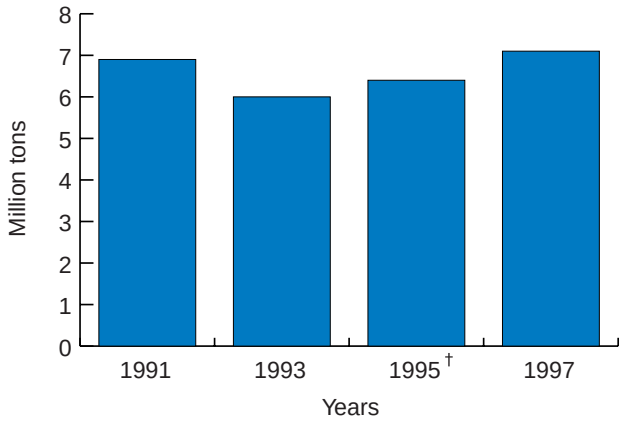
Most hazardous waste generated in Indiana is treated on site in treatment systems regulated by the Clean Water Act. During 1997, 95 percent of the hazardous waste generated was treated in this manner at the sites of generation. The remaining waste required more sophisticated treatment or disposal and was sent off site to permitted hazardous waste treatment, storage or disposal facilities.

During 1997, permitted treatment, storage and disposal facilities in Indiana received approximately 605,000 tons of hazardous waste from both in-state and out-of-state sources. This waste was recovered and reused, incinerated, landfilled or otherwise treated.

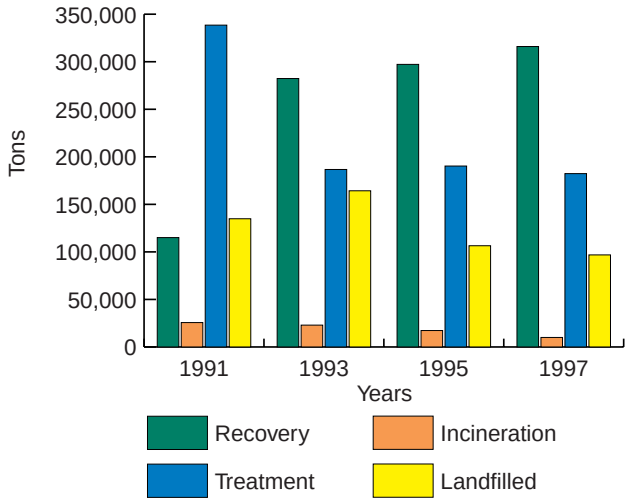
In 1997, Indiana shipped approximately 160,000 tons of hazardous waste to 26 states, 70,000 tons less than in 1995. Indiana treatment, storage and disposal facilities received approximately 260,000 tons of waste from 48 states, the same amount as in 1995.

† The amount of hazardous waste generated in 1995 was reported incorrectly in the *1998 State of the Environment Report* as 8.4 million tons due to a generating facility reporting error. The correct amount is 6.5 million tons.

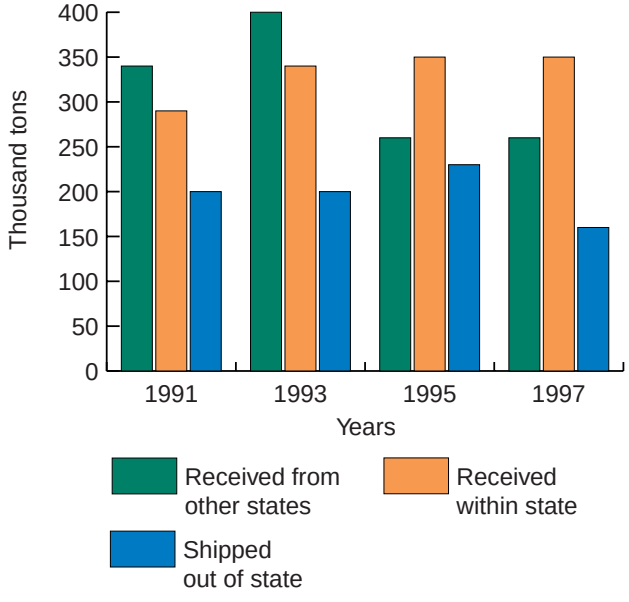
Hazardous waste generation



Hazardous waste management methods



Shipments of hazardous waste



Source: Resource Conservation and Recovery Act Biennial Hazardous Waste Report, 1991-1997

Solid waste

Disposal

Waste that is not diverted from disposal goes to a permitted landfill or incinerator. Disposal rates for all permitted municipal solid waste landfills and transfer stations vary by county, as shown by the map. In 1998, Indiana had 37 operating municipal solid waste landfills, down from 72 in 1991.

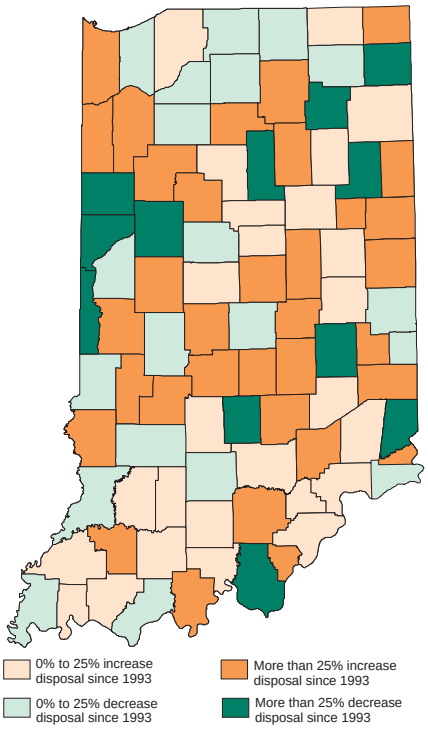
An estimated 400 landfills and municipal dumps have been closed in Indiana. Many of these sites were closed before environmental protection laws were in place and, therefore, may pose a risk to ground and surface water. State cleanup programs address these sites with 33 closed to minimize environmental and health concerns and six in the process of remediation.

Source reduction and recycling

Indiana encourages source reduction and recycling and, in 1990, established voluntary goals to reduce waste disposal 35 percent by January 1996 and 50 percent by January 2001. The source reduction and recycling rate for municipal solid waste decreased 3 percentage points between 1996 and 1997 from 24 percent to 21 percent.[†]

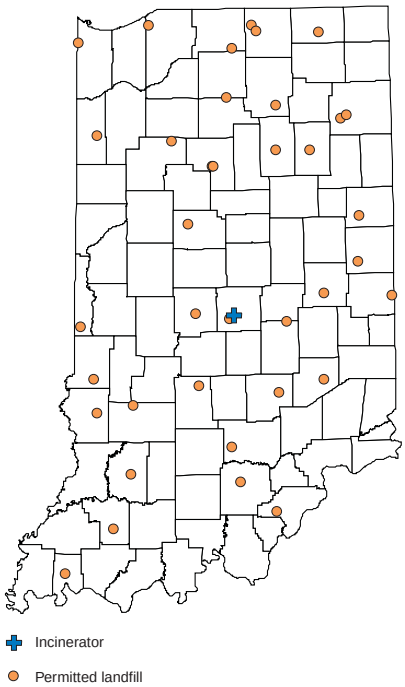
[†] The source reduction and recycling rate for 1996 was incorrectly reported in the *1998 State of the Environment Report* as 23 percent. The correct rate is 24 percent.

Disposal rates per county,* 1993-1997



* Based on information reported by Indiana landfills and transfer stations. Information from Ohio and Kentucky was also used. Information from Michigan and Illinois was not available.

Municipal solid waste disposal facilities



Source: IDEM Office of Pollution Prevention and Technical Assistance and Office of Solid and Hazardous Waste Management, 1998

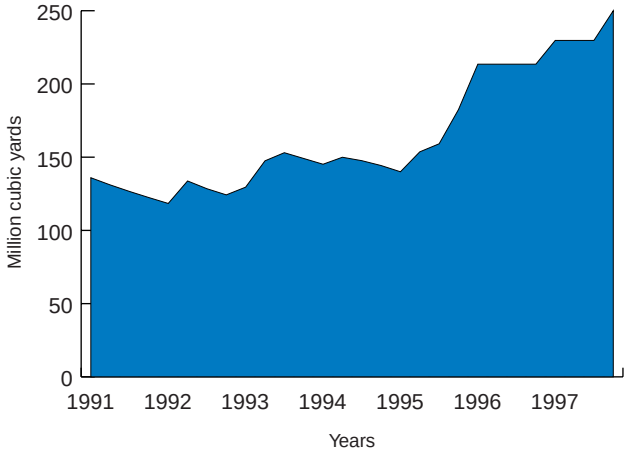
Municipal solid waste landfills

Although the number of landfills is decreasing, the average size of each is growing. At the end of 1997, Indiana's municipal solid waste landfills had a combined capacity of approximately 250 million cubic yards. This is an increase of nearly 110 million cubic yards from the 1995 total capacity. In 1998, 44 percent of Indiana landfill capacity was being utilized. Depending on disposal rates, this landfill space is predicted to last until sometime in 2011. However, it is expected that landfill expansions will continue to provide future capacity.

Waste imports affect the amount of landfill capacity available for Indiana residents and businesses. In 1997, out-of-state trash accounted for 27 percent of the waste disposed in Indiana's municipal solid waste landfills, 6 percentage points more than in 1996. In contrast, in 1997, an estimated 10 percent of Indiana's municipal solid waste was disposed out of state.

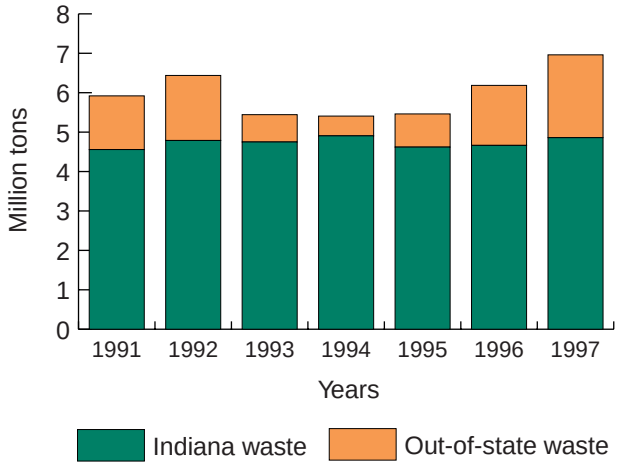
The design and construction of landfills over the years have improved significantly. New landfill areas are required to have composite liners made with a combination of compacted soil and plastic liners and systems to collect, treat and dispose of contaminated water from the landfill. These requirements help protect ground water from landfill leaks. The amount of Indiana's waste landfilled over composite liners in 1997 was 70 percent, an increase of 22 percentage points since 1995.

Indiana landfill capacity



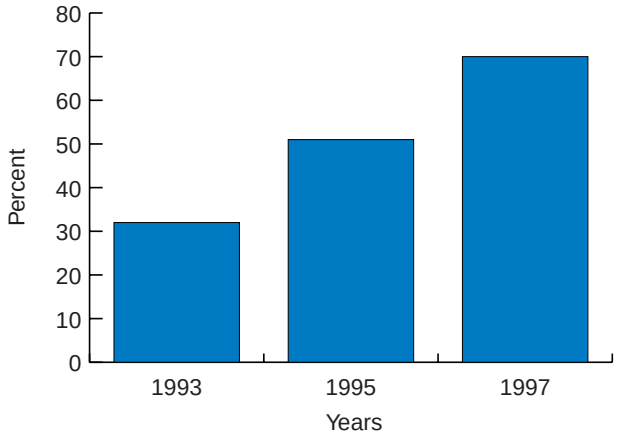
Source: IDEM Office of Solid and Hazardous Waste Management, 1998

Municipal solid waste disposal trends



Source: 1997 Indiana Solid Waste Facilities Annual Report

Municipal solid waste landfilled over composite liners



Source: 1997 Indiana Solid Waste Facilities Annual Report

Tire dumps

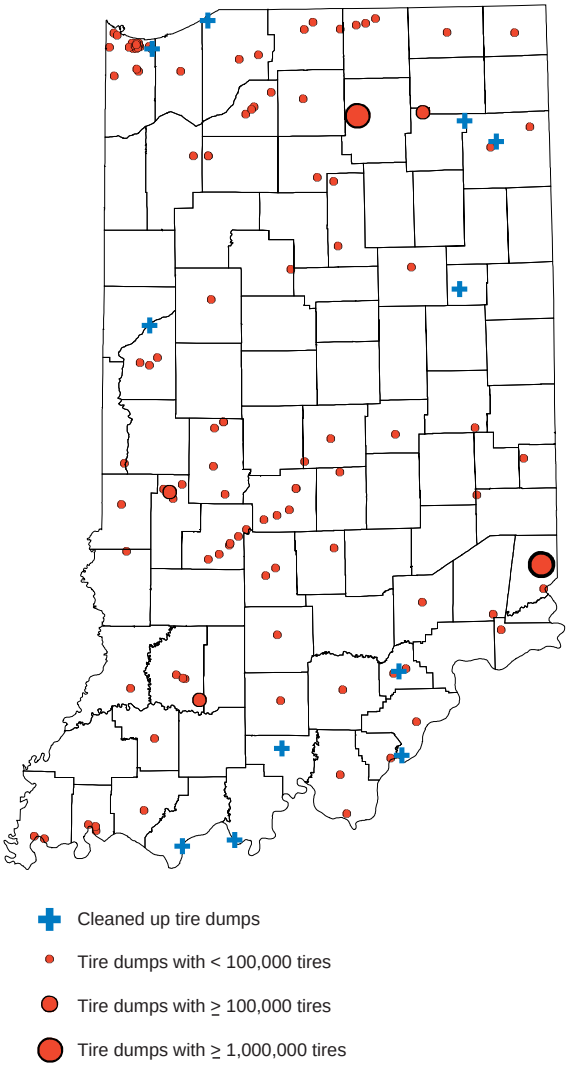
On average, Indiana generates about one waste tire per person per year–currently 5.5 million per year. From 1995 to 1997, more than 1.5 million tires were removed for proper disposal from dumps containing an estimated total of 18.5 million waste tires.

IDEM has identified 164 illegal tire dumps in Indiana. Eleven of these sites, with about 630,000 total tires, were cleaned by landowners or responsible parties in 1998. Four more sites, with an estimated 191,500 tires, were cleaned using state waste tire funds. By the end of 1998, however, IDEM had identified 10 more illegal tire sites. Cleanup of additional sites using state funds is planned for 1999.

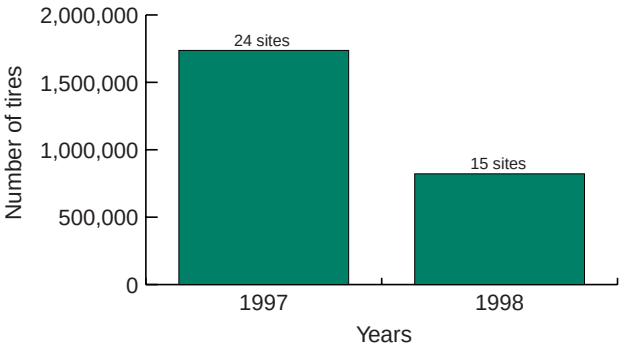
Problems with tire piles

Large waste tire piles are breeding grounds for disease-carrying mosquitos. If set on fire, large tire piles burn with intense heat, blowing thick, black hazardous smoke downwind. Tire fires are difficult to extinguish, sometimes burning for days.

Waste tire dumps



Waste tire cleanup



Source: IDEM Office of Solid and Hazardous Waste Management, 1998

Indiana State of the Environment Report

Chemicals

Photo courtesy of Science Works, Children's Museum of Indianapolis

Chemicals in Indiana are used in life-saving drugs, manufacturing processes and consumer products. While children can learn about chemistry at the Children's Museum of Indianapolis, Hoosiers should be free from worry about unsafe chemicals, whether they are breathing Indiana's air, paddling a canoe down Sugar Creek or playing football on the lawn.

Chemicals

Chemicals in Indiana's environment

Just as air pollution blows freely across county lines and water pollution flows downstream, many chemicals affect multiple segments of our environment. Many of these pollutants are toxic chemicals that persist in the environment and can cause long-term health effects or pose serious environmental concerns.

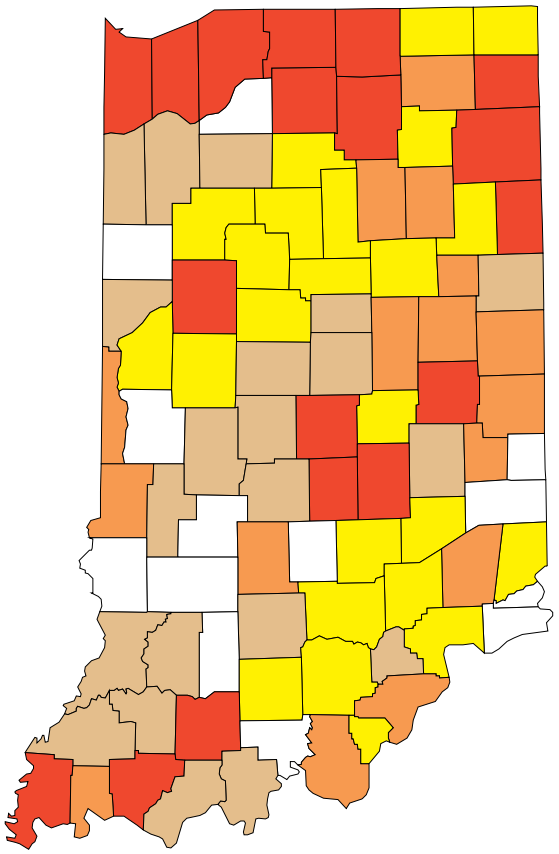
The U.S. Environmental Protection Agency (EPA) and IDEM collect information on toxic chemicals managed by manufacturers through the Toxic Release Inventory (TRI). Facilities must file a TRI report if they have 10 or more employees, are included in Standard Industrial Classification codes 20-39 and use, manufacture or process any listed toxic chemical in quantities greater than the established thresholds for a calendar year.

The TRI reports include information on the manufacturer's release of the listed toxic chemicals to the environment, the management of wastes containing these chemicals and annual changes in the production of products associated with these toxic chemicals.

TRI reports for 1997 were submitted by 1,000 Indiana facilities for 181 toxic chemicals. In 1995, 1,008 facilities submitted reports for 161 listed toxic chemicals.

For more details visit chemicals @ www.state.in.us/idem/soe/99report/chem

Toxic chemical releases from manufacturers



Source: Taylor University (map), 1999; Toxic Release Inventory database, 1997

Releases to the environment

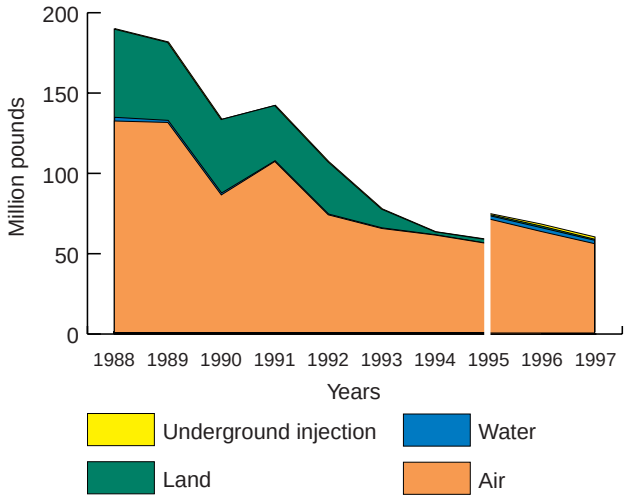
Indiana manufacturers reduced their reported releases of toxic chemicals from 190 million pounds in 1988 to 59 million pounds in 1997. This 69 percent reduction is based on chemicals that were subject to reporting for each of the ten years.

In 1995, EPA added nearly 300 new chemicals to the list of reportable toxic chemicals. Even with this expanded list of toxic chemicals, Indiana manufacturers have reduced reported releases 20 percent in two years. These reductions were accomplished while manufacturing activity increased 4 percent from 1995 to 1996 and 11 percent from 1996 to 1997.

Releases to air dropped 22 percent between 1995 and 1997. Five chemicals–toluene, ammonia, xylene, methylene chloride and styrene–contributed almost 50 percent of the air releases in 1997.

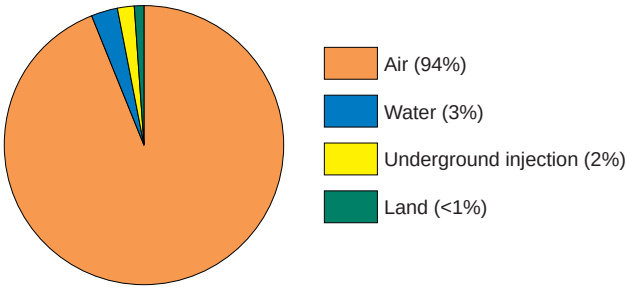
Lake and Elkhart counties had the most releases among Indiana's 92 counties. These two counties contributed more than 20 percent of the total toxic chemical releases.

Trends in toxic chemical releases*



* In 1995, EPA added 300 new chemicals to the Toxic Release Inventory. Of these, 20 compounds were not reported in Indiana but were included in the *1998 State of the Environment Report* for consistency with previous years. The break in the chart indicates this change in reporting.

Types of toxic chemical releases



Source: IDEM's Toxic Release Inventory database, 1997

Known and potential carcinogens

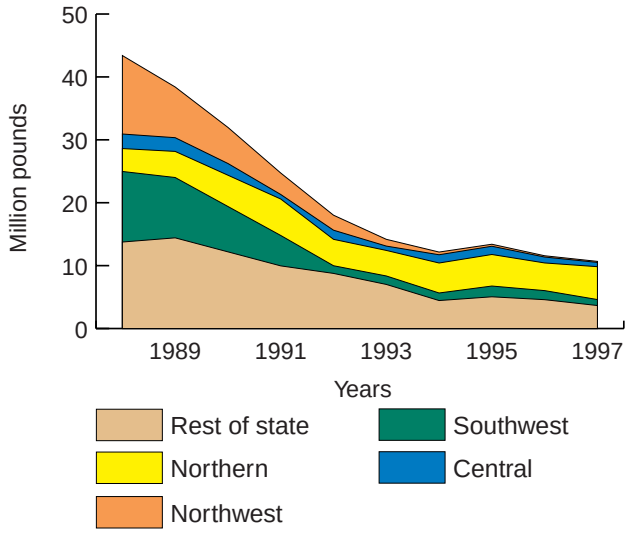
The TRI Program relies on the Occupational Safety and Health Administration's (OSHA) definition of "carcinogen" to identify chemicals that warrant special attention due to their potential to cause cancer in humans. The OSHA definition includes chemicals determined to be known, probable or possible carcinogens.

From 1988 to 1997, reported carcinogen releases decreased 75 percent, with a 20 percent reduction occurring between 1995 and 1997. Styrene and methylene chloride constituted more than 75 percent of carcinogen releases in 1997.

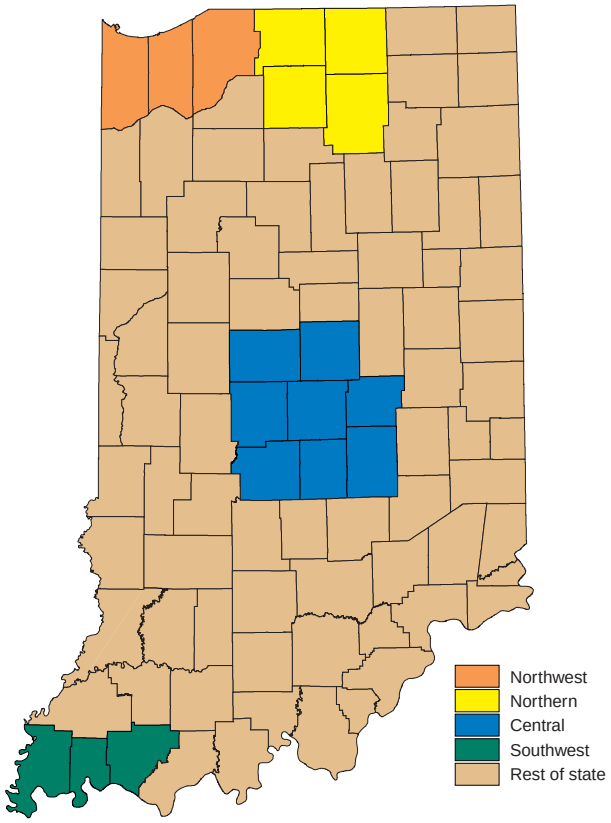
Indiana has designated four regions with large urban populations and significant manufacturing activity as priority regions. These four regions account for 66 percent of the total reported releases of carcinogenic chemicals in 1997, with Elkhart County contributing almost 35 percent of total reported releases.

The northwest, central and southwest regions reduced their reported carcinogen releases by approximately 45 percent between 1995 and 1997. The northern region had a 4 percent increase in releases over the two year period and an 18 percent increase in releases from 1996 to 1997. A more accurate method of reporting releases of styrene is responsible for a majority of this 18 percent increase.

Trends in known and potential carcinogen releases



Priority urban areas for carcinogens



Source: IDEM's Toxic Release Inventory database, 1997

Environmental waste

Often, toxic chemicals are contained in environmental wastes that are disposed in permitted landfills, recycled, burned for energy recovery or destroyed through treatment. These activities may occur at the manufacturing site or at a waste management facility.

Between 1992 and 1995, Indiana saw an increase in toxic chemicals in environmental waste of 1.2 percent. From 1995 to 1996, the increase was 15 percent, due to increases in production. From 1996 to 1997, the total decreased 3.3 percent while production increased 11 percent.

Pollution Prevention Progress

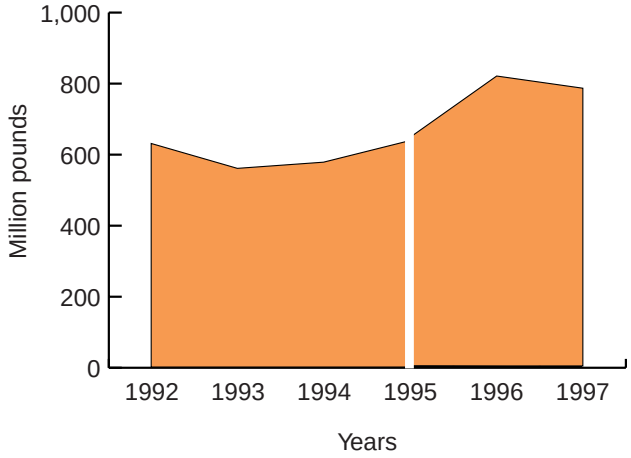
Pollution prevention, or source reduction, is a preferred method of environmental protection in Indiana. It includes practices that reduce or eliminate the creation of pollutants by increased efficiency in the use of resources and the conservation of natural resources. Pollution prevention is not recycling, energy recovery, treatment or disposal.

Indiana measures pollution prevention progress for manufacturers using the TRI Program. It compares the annual change in toxic chemicals in environmental waste with the annual change in production. The percent change in production minus the percent change in waste is the net pollution prevention progress.†

From 1992 to 1997, Indiana has made a net gain of 24 percentage points in pollution prevention. From 1996 to 1997, the gain was 14 percentage points.

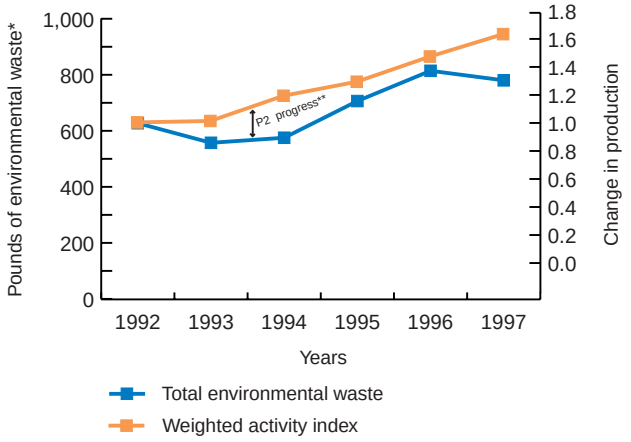
† Change in production reflects the change in production of those products directly associated with the amount of toxic chemicals in environmental waste.

Trends in toxic chemicals in environmental waste generation*



* In 1995, EPA added 300 new chemicals to the Toxic Release Inventory. Of these, 20 compounds were not reported in Indiana but were included in the *1998 State of the Environment Report* for consistency with previous years. The break in the chart indicates this change in reporting.

Pollution prevention (P2) progress



* The increases from 1994 to 1995 were adjusted for additional chemicals.

** Gap is proportional to pollution prevention progress.

Source: IDEM's Toxic Release Inventory database, 1997

Toxics of special concern

Lead

Lead is a naturally occurring metal used in piping, building materials, solder, paint and ammunition. Lead paint in homes is believed to be the major source of lead poisoning. Elevated blood lead levels (EBLs) typically are found in low-income areas and areas with older homes. In recent years, lead-acid storage batteries, metal products, chemicals and pigments have contained the most lead.

Since EPA banned lead in gasoline, paint, pipes, solder, food cans and other products, blood lead levels have dropped dramatically throughout the United States. Blood lead levels for individuals in the United States fell 78 percent from the 1976-1980 average of 12.9 micrograms per deciliter (ug/dL) to 2.9 ug/dL in 1991-1998. For the same time periods, the percent of U.S. children with blood lead levels at or above 10 ug/dL fell from 84.0 percent to 8.9 percent.

Excessive exposure to lead can elevate blood levels of the toxin in adults and children and can slow and permanently damage the mental and physical development of children age 6 and under.

The percentage of Indiana children with higher than normal lead levels is greater than the Centers for Disease Control and Prevention's national average of 4.4 percent. From 1995 to 1998, 99,000 Indiana children were screened for lead. Ten percent of these children were determined to have elevated levels of lead in their blood.

Elevated blood lead levels test results, 1995-1998

Data is collected in counties where significant numbers of children with elevated blood lead levels were found prior to 1997.

Source: Indiana State Department of Health, Childhood Lead Poisoning Prevention Program, 1998

EBLs may result in learning disabilities, behavioral problems, mental retardation and seizures. The severity of these results depends on the degree and duration of the EBL.

10 ug/dL or greater is considered "elevated" and is associated with harmful effects on children's behavior.

15-17 ug/dL for 3 months or **20 ug/dL or greater** requires a physician's treatment.

70 ug/dL or greater causes devastating health consequences, including seizures, coma and death.

Source: Centers for Disease Control and Prevention, and National Center for Environmental Health, 1997

Mercury and PCBs

Two toxic chemicals, mercury and polychlorinated biphenyls (PCBs), are the major contaminants found in Indiana fish. Mercury is a naturally occurring metal which does not break down, but recycles between land, water and air. It is also released by coal-burning power plants and the burning of household, medical and industrial waste. PCBs are synthetic oils that break down very slowly in the environment and were once widely used in electrical transformers and capacitors. Health problems resulting from contaminants, such as mercury and PCBs found in fish, range from nearly undetectable changes to birth defects and cancer, with children being the most susceptible. Mercury may damage the central nervous system, while PCBs may damage the liver, kidneys and central nervous system and are probable human carcinogens.

Mercury and PCBs collect in the soil, water, sediment and microscopic animals. They build up in fish, especially in those fish that eat other fish. Each year, the *Indiana Fish Consumption Advisory* is issued by the Indiana State Department of Health through cooperative efforts with IDEM and the Indiana Department of Natural Resources. The advisory serves as a guide for fish consumption, categorizing Indiana waterways in five groups ranging from "unrestricted consumption" (group 1) to "do not eat" (group 5). The map to the right shows the waterways with the greatest mercury and PCB threats.

In 1998, approximately 1,500 miles of Indiana's 37,000 miles of rivers and streams were categorized as "do not eat." For nearly 200 of these miles, the categorization pertained to all species, while almost 1,300 miles were for at least one species other than carp. Initial analysis of fish tissue collected from long-term monitoring sites located throughout the state has shown a general decline in PCBs; however, levels of mercury appear unchanged over time.

Most serious mercury and PCB levels in fish

In all Indiana rivers and streams, carp are contaminated with both PCBs and mercury. Do not eat carp that are over 25 inches in length. Pregnant women, women planning to have kids, and kids under age 15 should not eat carp over 15 inches.

Source: Indiana Fish Consumption Advisory, 1997 & 1998

For More Information

Indiana Department of Environmental Management

www.state.in.us/idem

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(800) 743-3333 or (317) 232-6565
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Three Indianapolis locations:

- Indiana Government Center North, downtown
- Indiana State Teachers Association building, downtown
- Western Select Properties, Shadeland Ave.

Northwest Regional Office

(888) 209-8892 or (219) 881-6712
Mailing address:
NBD Bank Building
504 N. Broadway, Ste. 418
Gary, IN 46402-1942

Northern Regional Office

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Mailing address:
220 W. Colfax Ave., Ste. 200
South Bend, IN 46601-1634

Southwest Regional Office

(888) 672-8323 or (812) 436-2570
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Evansville, IN 47708-1353

Indiana Environmental Circuit Rider

www.citiesandtowns.org
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Indiana Department of Natural Resources

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402 W. Washington St.
Indiana Government Center South, Ste. W256
Indianapolis, IN 46204

Indiana State Department of Health

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